INSTRUCTION MANUAL

R-9001-11

TAPE READER/PUNCH CONTROLLER

RO/RP

EECO

DOC. NO. 11138

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TAPE READER/PUNCH CONTROLLER

R-9001-11

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EECO

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TABLE OF CONTENTS

Paragraph		Page
	Section I - General Description	
1-1	Equipment Description	1-1
1-2	Tape Reader/Punch Controller Specifications	1-1
1-3	Construction	1-1
1-4	Environmental	1-2
1-5	Logic Implementation	1-2
1-6	Controller Configurations	1-2
	Section II - Installation	
2-1	General	2-1
2-2	Computer Installation	2-1
2-3	Tape Reader/Punch Installation	2-1
2-4	Input/Output Logic Level Select	2-1
2-5	Alternate Device Addresses	2-2
2-6	Alternate Interrupt Priority Assignments	2-3
2-7	Operation	2-4
	Section III - Software	
3-1	General	3-1
3-2	Device Addresses	3-2
3-3	Interrupt Priority Levels	3-2
3-4	Interrupt Vector	3-2
3-5	Reader Status Register (PRS)	3-2
3-6	Reader Buffer Register	3-3
3-7	Punch Status Register (PPS)	3-4
3-8	Punch Buffer (PPB)	3-4
3-9	Tape Reader Programming Example	3-5
3-10	Tape Punch Programming Example	3-6
	Section IV - Functional Description	
4-1	General Description	4-1
4-2	Address Selection	4-1
4-3	Interrupt Control	4-5
4-4	Tape Reader Control Logic	4-6
4-5	PRS Register	4-6
4-6	PRB Register	4-7
4-7	Tape Reader System Overview	4-7
4-8	Tape Punch Control Logic	4-7

TABLE OF CONTENTS (Continued)

Paragraph		Page
	Section IV - Functional Description (Continued)	
4-9	PPS Register	4-7
4-10	PPB Register	4-8
4-11	Tape Punch System Overview	4-8
	Section V - Punched Tape Diagnostic Program Description	
5-1	Scope	5-1
5-2	Special Hardware Requirements	5-1
5-3	Special Test Tape	5-1
5-4	Loading Procedure	5-2
5-5	Starting Procedure	5-2
5-6	Tape Reader Program Description	5-2
5-7	Tape Punch Program Description	5-3
5-8	Diagnostic Program Printout	5-4
	Section VI - Parts Lists	
6-1	General	6-1
6-2	Parts Lists Index	6-1
	Section VII - Drawings	
7-1	General	7-1
7-2	Drawing Index	7-1

LIST OF TABLES

Table		Page
2-1	Input/Output Logic Level Selector	2-2
2-2	Device Address Selector	2-3
2-3	Reader Priority Level Selector	2-4
2-4	Punch Priority Level Selector	

LIST OF ILLUSTRATIONS

Figure		Page
4-1	Reader Controller Block Diagram	4-2
4-2	Punch Controller Block Diagram	4-3
4-3	Timing Charts	4-4
5-1	Special Test Tape Splice Information	5-1

SECTION I

GENERAL DESCRIPTION

1-1. EQUIPMENT DESCRIPTION.

The EECO Model R-9001-11 Tape Reader/Punch Controller (controller) provides the logic which allows program control of an EECO Tape Reader and an EECO Tape Punch. The Model R-9001-11-RP provides control facilities for both a Tape Reader and a Tape Punch. The Model R-9001-11-RO provides control facilities for a Tape Reader only. The controller is designed for use with Digital Equipment Corporation PDP-11 family of Computers.

The EECO Tape Reader/Punch may be used in any DEC PDP-11 Computer system configuration which does not have a device using addresses 70, 72, 74, 76, 177550, 177552, 177554, and 177556. The tape reader/punch may be equipped with any electronic mode options and driven asynchronously up to its rated speed, under control of a software program. Device addresses and interrupt priority levels are selected as described in paragraphs 3-1 and 3-2.

The controller plugs directly into the small peripheral connector (SPC). The card is equipped with an integral interconnecting cable and connectors. No additional cables, power supplies, or hardware are required. The controller provides for full compatibility with current software systems designed for the PDP-11 Computer. No software changes are required.

A comprehensive diagnostic program is provided with the equipment. A printout of the diagnostic program is included in Section V.

1-2. TAPE READER/PUNCH CONTROLLER SPECIFICATIONS.

1-3. Construction.

The controller logic is implemented on a single epoxy glass printed circuit card. Plated through holes, solder plating, and gold edge connectors are standard construction. The controller contains all interconnecting cables and connectors for the punched tape system.

1-4. Environmental.

Necessary cooling and power are derived from the Computer Mainframe. No external power supplies, cooling or additional hardware are required. The ambient operating temperature range is 55° to 100°F. The ambient operating humidity range is 20% - 95% without condensation.

1-5. Logic Implementation.

MSI and TTL technology are utilized. SP380 and 7438 integrated circuits are utilized in the Unibus interface to reduce loading effects.

1-6. Controller Configurations.

The Model R-9001-11-RP Tape Reader/Punch Controller provides the necessary logic for software control of an EECO Model 9300 Series Tape Reader and an EECO Model 9960 Series Tape Punch.

The Model R-9001-11R Tape Reader Controller provides the necessary logic for software control for a single EECO Model 9300 Series Tape Reader.

SECTION II
INSTALLATION

2-1. GENERAL.

This section describes the procedures for the proper installation of the Tape Reader/Punch Controller (controller). Installation should be performed by qualified personnel only.

WARNING

Before any attempt is made to install the controller, remove AC power from the Computer and Tape Reader/Punch System.

2-2. COMPUTER INSTALLATION.

Remove the access cover allowing access to the module side of the Unibus. Remove the Grant Continuity Module (G727) (GCM) from any free Small Peripheral Connector (SPC) position. Insert the controller card in slots C, D, E, F of the SPC, making sure the card is properly seated in the connector blocks. Insert the Grant Continuity Module (G727) in the next free SPC slot, if any. The controller must be installed in a pre-wired DD11-A Peripheral Mounting Panel or equivalent system module. Route the interconnecting cables down the cable-way and out the rear of the Computer. Replace the access cover.

2-3. TAPE READER/PUNCH INSTALLATION.

Connect the integral interconnecting cables to the mating connectors on the rear of the Tape Reader and the Tape Punch.

2-4. INPUT/OUTPUT LOGIC LEVEL SELECT.

The controller is set at the factory for negative logic levels on all input/output signals. These levels are:

Logic 1 = TRUE = 0 to +0.5 VDC

Logic 0 = FALSE = +2.4 to +5 VDC

Input/output logic level selection switches may be set for either positive or negative logic levels. Refer to Table 2-1 and set the switches for the desired logic level conditions.

Table 2-1. Input/Output Logic Level Selector

Signal Name	SW	*Positive Logic	**Negative Logic
PUNCH COM	1	ON	OFF
TAPE ERROR	2	ON	OFF
PUNCH READY	3	ON	OFF
PUNCH DIRECTION	4	OFF	ON
OUTPUT DATA	5	ON	OFF
INPUT DATA	6	ON	OFF
READ CLK	7	ON	OFF
DRIVE LEFT	8	OFF	ON
DRIVE RIGHT	8	OFF	ON

*Positive Logic: Logic 1 = TRUE = +2.4 to +5.0 VDC
Logic 0 = FALSE = 0 to +0.5 VDC

**Negative Logic: Logic 1 = TRUE = 0 to +0.5 VDC
Logic 0 = FALSE = +2.4 to +5.0 VDC

2-5. ALTERNATE DEVICE ADDRESSES.

Alternate device addresses may be selected by adding or removing jumpers A-K on the FC board. See Table 2-2 for details.

Table 2-2. Device Address Selector

Bit	Jumper
A03	K
A04	J
A05	H
A06	G
A07	F
A08	E
A09	D
A10	C
A11	B
A12	A

2-6. ALTERNATE INTERRUPT PRIORITY ASSIGNMENTS.

Other priority levels than the standard level 4 may be assigned to the controller. See Table 2-3 and page 3 of schematic 127062 for jumper selection of tape reader interrupt levels. See Table 2-4 and page 4 of schematic 127062 for jumper selection of tape punch interrupt levels. In each case, the three BG IN lines which are not used must be jumpered to corresponding BG OUT lines.

For example, let both devices have a #4 priority interrupt level with the reader having a higher priority than the tape punch.

a. Select jumpers ZZ and FF for the tape reader. Also jumper:

BG 'G' IN to BG 'S' OUT

BG 'H' IN to BG 'T' OUT

BG 'J' IN to BG 'U' OUT

b. Select jumpers YY, KK, and PP for the tape punch. Also jumper:

BG 'C' IN to BG 'N' OUT

BG 'B' IN to BG 'M' OUT

BG 'A' IN to BG 'L' OUT

Table 2-3. Reader Priority Level Selector

LEVEL	BR	BG IN	BG OUT
4	ZZ	FF	RR
5	AB	GG	SS
6	AC	HH	TT
7	AD	JJ	UU
		EE(PUN BG OUT)	

Table 2-4. Punch Priority Level Selector

LEVEL	BR	BG IN	BG OUT
4	YY	DD	PP
5	XX	CC	NN
6	WW	BB	MM
7	VV	AA	LL
		KK (RDR BG OUT)	

2-7. OPERATION.

This completes the mechanical and electrical installation of the controller. No operator interaction or adjustments are required. The user should, however, be familiar with the general operation of the Computer and Punched Tape System. Correct controller operation should be verified by executing the Punched Tape Diagnostic Program. (See section V).

SECTION III

SOFTWARE

3-1. GENERAL.

Programming of peripherals is extremely simple on the PDP-11; a special class of instructions to deal with input/output operations is unnecessary. The Unibus permits a unified addressing structure in which control, status and data registers for peripheral devices are directly addressed as memory locations. Therefore all operations on these registers, such as transferring information into or out of them or manipulating data within them, are performed by normal memory reference instructions.

The PDP-11 controls devices differently than most computer systems. Control functions are assigned to a register address, and then the individual bits within that register can cause control operations to occur. For example, the command to make the tape reader read a frame of tape is provided by setting a bit (RDR ENB) in the control register for this device. Instructions such as MOV and BIS may be used for this purpose. Status conditions are also handled by the assignment of bits within this register, and the status is checked with TST, BIT, and CMP instructions.

A device that is capable of becoming bus master generally requests use of the bus to interrupt program execution and force the Processor to branch to a specified address where an interrupt service routine is located. If the appropriate interrupt enable bit is set in the control and status register of a device, transition from 0 to 1 of the DONE or ERROR bit causes an interrupt request to be issued to the Processor. Priorities permitting, the Processor relinquishes bus control to the device.

When the device gains control of the bus, it sends the Processor an interrupt command and a unique address of a memory location which contains the starting address of the device service routine. This is called the interrupt vector address. Immediately following this pointer is a word to be used as the new processor status (PS) word. The processor pushes the current processor status word and then the program counter (PC) value on to the processor stack. The new PS and PC are taken from the address specified by the device, and the device service routine is initiated. Since each device has a unique interrupt vector which dispatches control to the appropriate interrupt service handling routine immediately, no device polling is required.

3-2. DEVICE ADDRESSES.

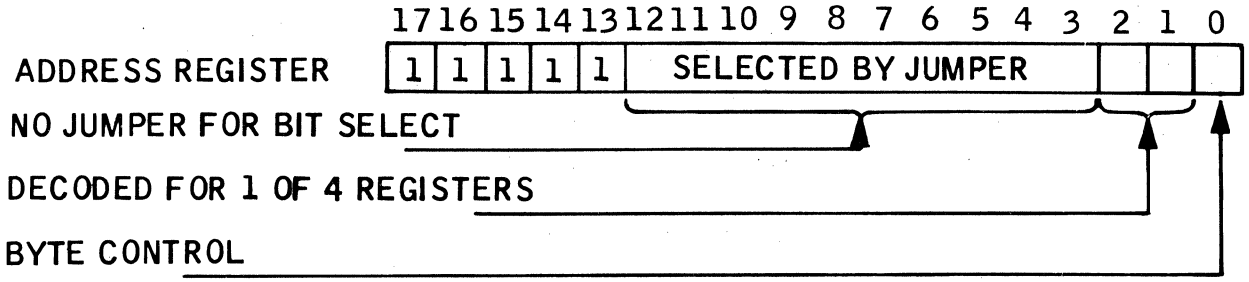
The controller is assigned the following standard addresses:

(a) Reader Status Register (PRS) = 777550

(b) Reader Buffer Register (PRB) = 777552

(c) Punch Status Register (PPS) = 777554

(d) Punch Buffer Register (PPB) = 777556



Refer to Section II for selection of alternate device addresses.

3-3. INTERRUPT PRIORITY LEVELS.

The standard controller is assigned a priority interrupt level #4. The reader has a higher priority than the punch if both request service simultaneously. Refer to Section II for selection of alternate interrupt priority levels.

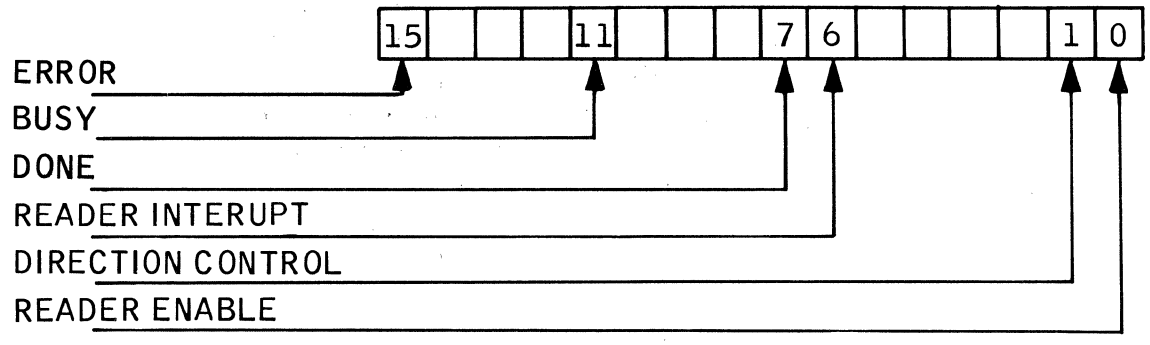
3-4. INTERRUPT VECTOR.

The Tape Reader Interrupt Vector is 000070.

The Tape Punch Interrupt Vector is 000074.

3-5. READER STATUS REGISTER (PRS)

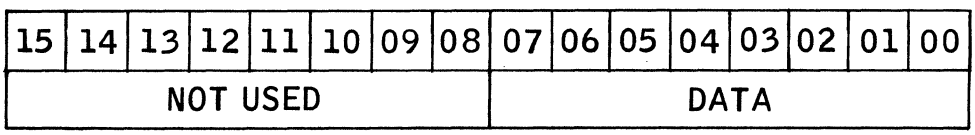
The PRS register is a read/write register for transfer of control and status information between the processor and controller. The PRS register is assigned the address 177550.



Bit	Name	Description
15	ERROR	Indicates an error condition. The Reader has no tape or the Reader has no power. Causes an interrupt if RDR INT ENB is set. Read only.
11	BUSY	Indicates that a character is in the process of being read. Cleared by INIT, set by RDR ENB, cleared when character is available in reader buffer.
07	DONE	Character available in buffer. Cleared by INIT, set when character available, cleared by referencing the reader buffer (PRB), cleared by setting RDR ENB, causes interrupt when RDR INT ENB is set. Read only.
06	RDR INT ENB	Interrupt enable. Enables ERROR or DONE to cause an interrupt, cleared by INIT. Read/write.
01	DIRECTION CONTROL	One (1) state causes reader to move tape from right to left. Zero (0) state causes reader to move tape from left to right.
00	RDR ENB	Enables the Reader to fetch one character. Clears DONE, sets BUSY and clears reader buffer. Write only.

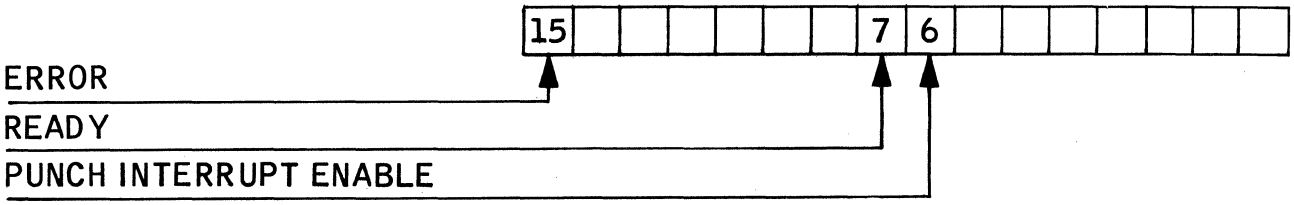
3-6. READER BUFFER REGISTER (PRB).

The PRB register is a read only register that holds the last character read from the reader. The PRB register is assigned the address 177552. Referencing the PRB register clears the DONE bit of the PRS register.



3-7. PUNCH STATUS REGISTER (PPS).

The PPS register is a read/write register for transfer of control and status information between the Processor and Controller. The PPS register is assigned the address 177554.



Bit	Name	Description
15	ERROR	Indicates an error condition. The Punch has no power. Causes an interrupt if PUN INT ENB is set. Read only.
07	READY	Ready to punch a character. Set by INIT, cleared by loading the PPB register, set when punching is complete. Read only.
06	PUN INT ENB	Interrupt enable. Enables ERROR or READY to cause an interrupt. Cleared by INIT. Read/write.

3-8. PUNCH BUFFER (PPB).

The PPB register is a write only register which contains the character to be punched. The PPB register is assigned the address 177556. Referencing the PPB registers clears the READY bit of the PPS register and initiates punching.

3-9. TAPE READER PROGRAMMING EXAMPLE.

(a) Non-Interrupt routine: The following routine will read one character from the Reader and place it in register RO.

```
RO    = %0
PRS   = 177550
PRB   = 177552

READ:   INC PRS          ; FETCH A CHARACTER

WAIT:   TST PRS          ; TEST ERROR BIT OF PRS
        BMI ERROR        ; BRANCH TO ERROR ROUTINE
        TSTB PRS         ; TEST DONE BIT OF PRS
        BPL WAIT         ; BRANCH IF CHAR IS NOT READY
        MOVB PRB, RO     ; PLACE CHAR IN REGISTER RO
```

(b) Interrupt routine:

```
; READER INTERRUPT VECTOR

70:     RDRINT           ; ENTRY TO INTERRUPT SERVICE
                           ROUTING
72:     000200           ; SETS STATUS TO PRIORITY 4

START:  MOV #101, PRS    ; SET RDR INT ENB AND RDR ENB
                           BITS
        BR MAIN          ; EXECUTE MAIN PROGRAM

RDRINT: TST PRS          ; TEST FOR ERROR
        BMI ERROR        ; BRANCH TO ERROR ROUTINE
        MOVB PRB, RO     ; PLACE CHAR IN RO
        INC PRS          ; SET RDR ENB BIT
        RTI              ; RETURN TO MAIN PROGRAM
```

3-10. TAPE PUNCH PROGRAMMING EXAMPLE.

(a) Non-Interrupt routine: The following routine will punch one character from register RO.

```
RO    = %0
PPS   = 177554
PPB   = 177556

PUNCH:  TST PPS         ; TEST FOR ERROR
        BMI ERROR       ; BRANCH IF ERROR

PWAIT:  TSTB PPS        ; TEST FOR DONE
        BPL PWAIT       ; WAIT FOR DONE BIT
        MOV RO, PPB     ; PUNCH REGISTER
```

(b) Interrupt routine:

```
74:     PUNINT          ; ENTRY TO INTERRUPT SERVICE
                          ROUTINE
76:     000200          ; SETS STATUS TO PRIORITY 4

START:  MOV #100, PPS   ; SET PUN INT ENB
        BR MAIN         ; EXECUTE MAIN PROGRAM

PUNINT: TST PRS         ; TEST FOR ERROR
        BMI ERROR       ; BRANCH IF ERROR
        MOV RO, PPB     ; PUNCH REGISTER
        RTI             ; RETURN TO MAIN PROGRAM
```

SECTION IV

FUNCTIONAL DESCRIPTION

4-1. GENERAL DESCRIPTION.

The following discussions assume a working knowledge of the PDP-11. The Tape Reader/Punch Controller (controller) logic is integrated with the PDP-11 Unibus and consists of address selection logic, interrupt control logic, tape reader data and control logic, and tape punch data and control logic. This is illustrated in block diagram form in Figures 4-1 and 4-2 for the tape reader and the tape punch, respectively.

Note

Refer to Section II for setup of correct input/ output logic levels prior to operation of equipment.

4-2. ADDRESS SELECTION.

The address selection logic decodes the PRS (177550) and PRB (177552) device addresses. See figure 4-3a for a timing diagram of this logic. The input signals consist of 18 address lines. A (17:00); 2 bus control lines, C (1:0); and a master synchronization line, MSYN. The address format, used for selecting a device register, is as follows:

1. Address lines A (17:13) must be all ones. This specifies an address within the top 8K byte address bounds for device registers.

2. Decoding of lines A (12:03) determines if the device is being referenced.

3. Lines A01 and A02 are decoded to select one of two addressable device registers, PRS or PRB.

4. Line A00 is used for byte control.

Control lines C (1:0) are coded by the master device to control the slave data transfer operations.

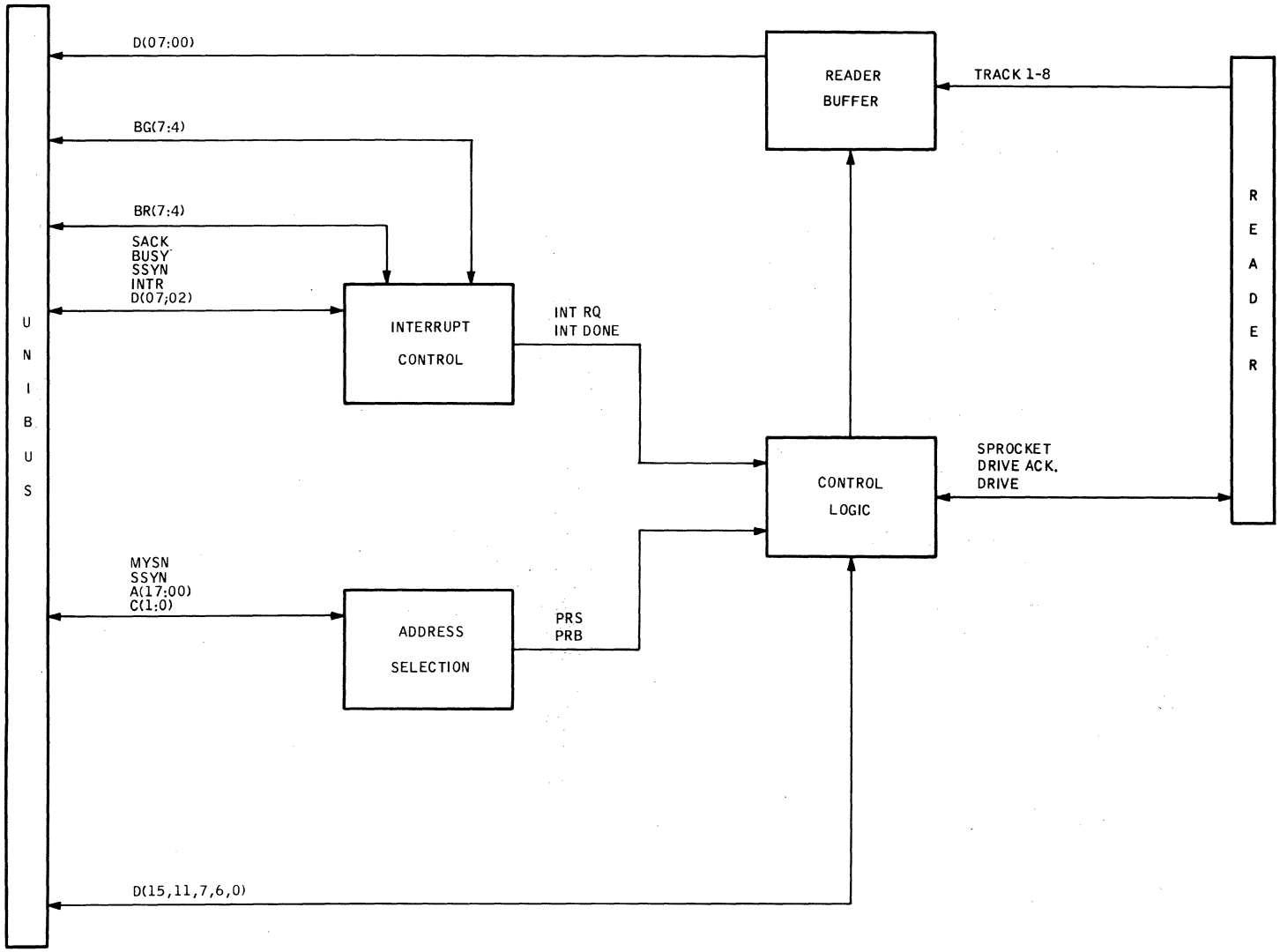


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Figure 4-1. Reader Controller Block Diagram

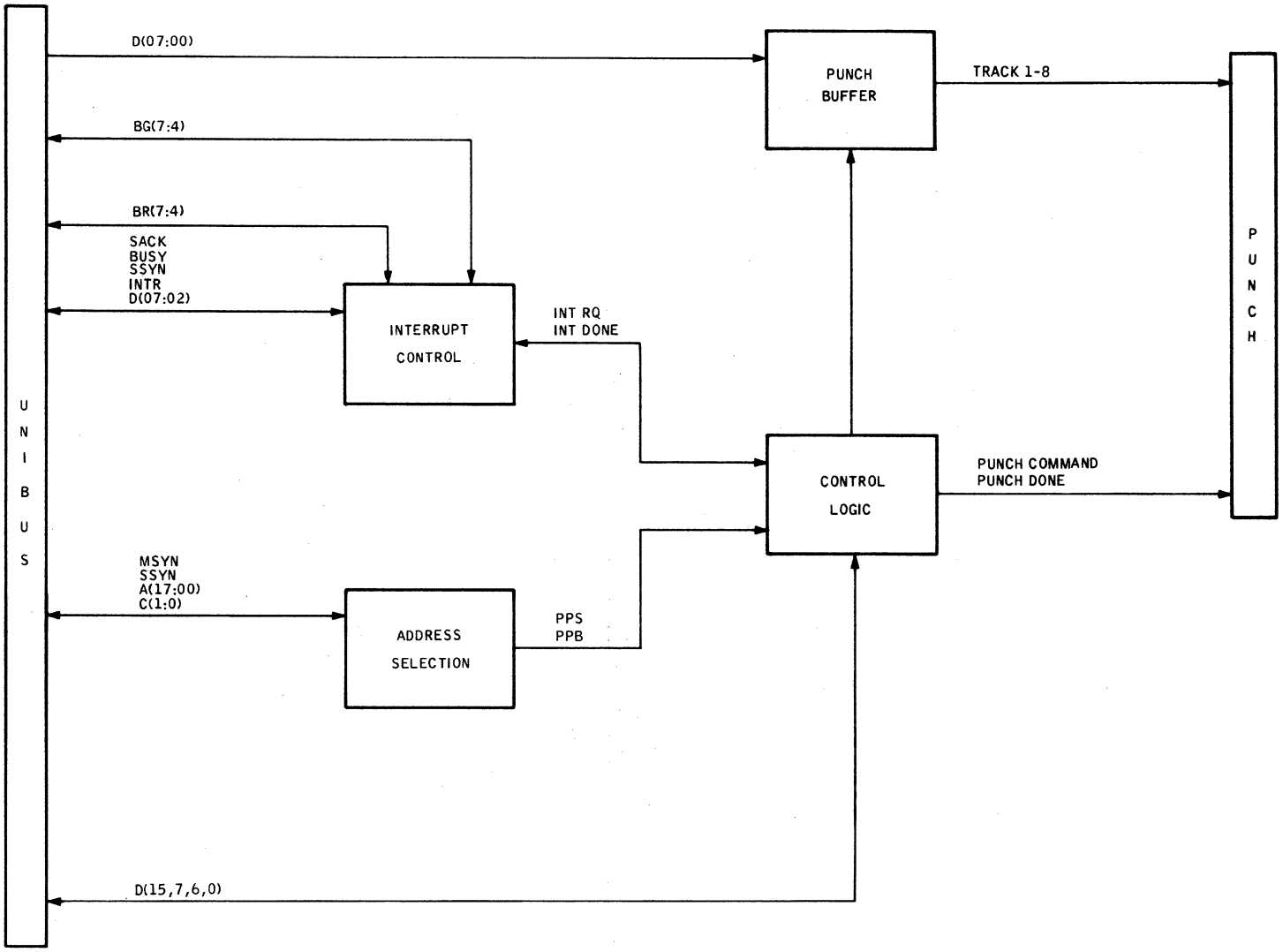
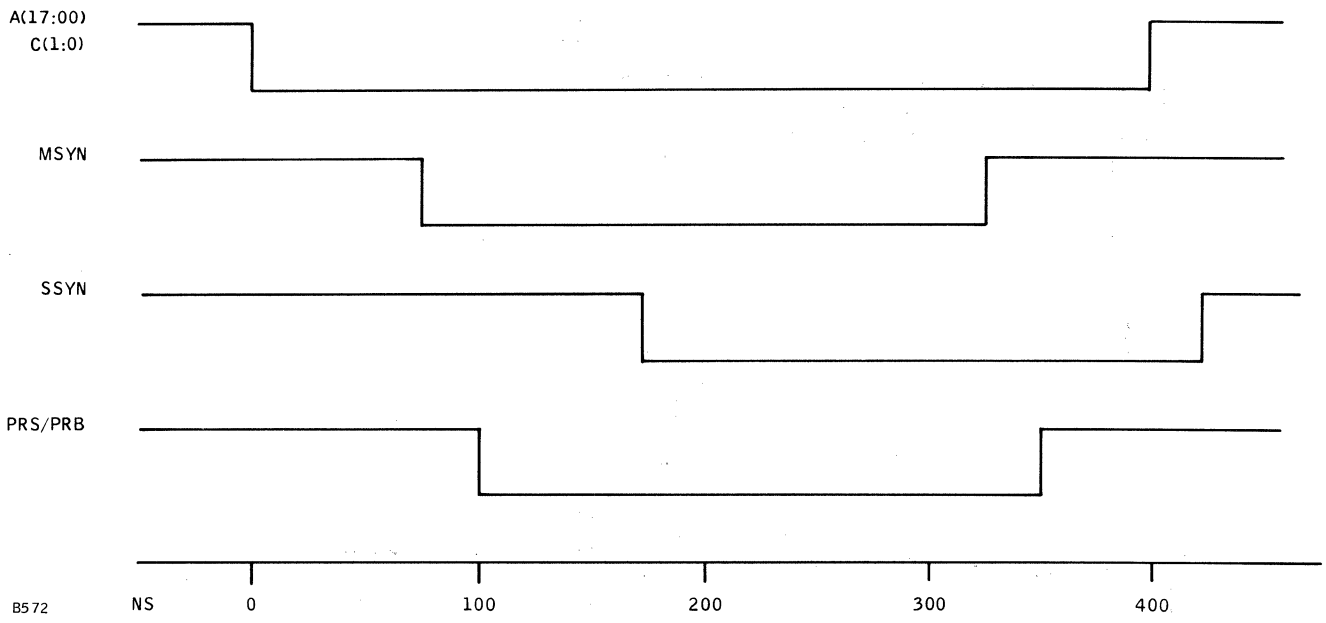


Figure 4-2. Punch Controller Block Diagram

(a) Address Selection Timing (all times are nominal)



(b) Bus Master and Interrupt Timing (all times are nominal)

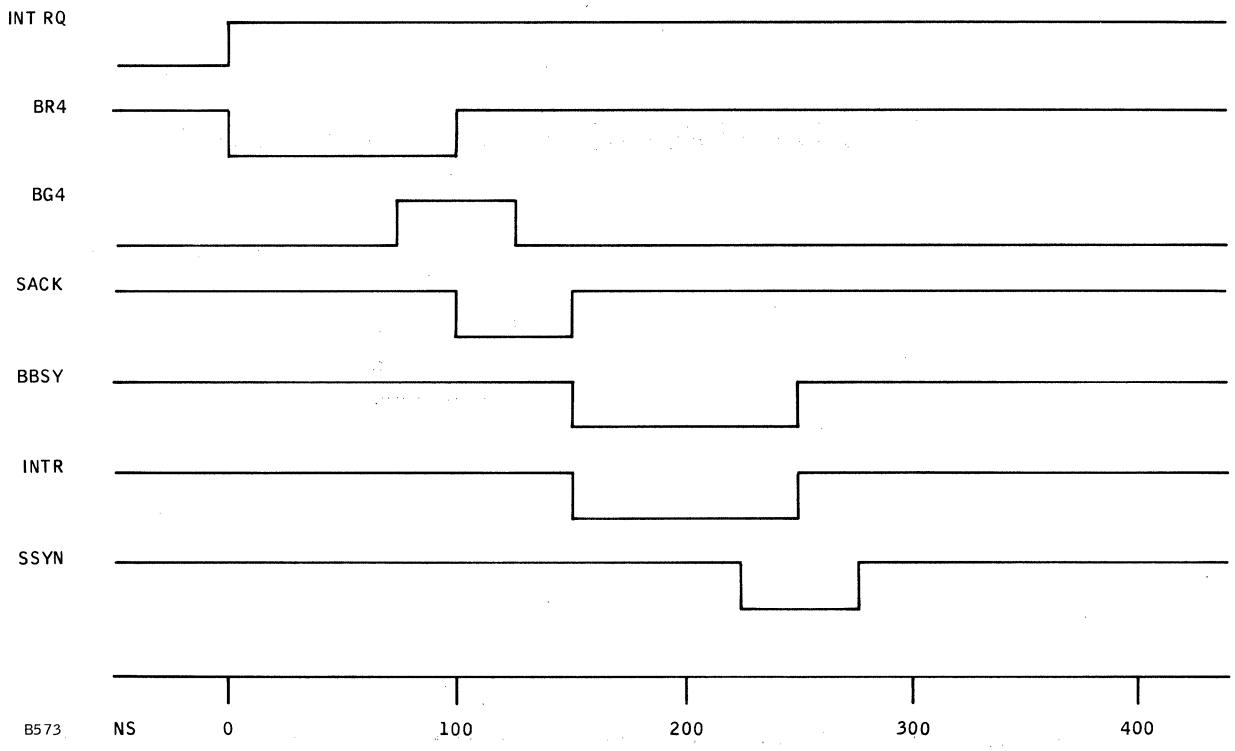


Figure 4-3. Timing Charts

MSYN and SSYN Synchronization: Master Synchronization (MSYN) is a control signal used by the master to indicate to the slave that address and control information are present on the Unibus.

Slave synchronization (SSYN) is the slave's response to the master that the device address has been received and decoded.

Note

Refer to paragraph 2-2 for setup of alternate device addresses.

4-3. INTERRUPT CONTROL.

The interrupt control logic allows the controller to make bus requests and generate priority interrupts. See figure 4-3b for a timing diagram of this logic. When the INT ENB bit of the PRS register is set and the INT RQ line is asserted the controller gains control of the bus as follows:

1. The controller asserts the BR4 line.

2. The processor receives one or more BR signals. These signals enter a priority arbitration system, which compares BR levels with the processor priority levels. If the request has the highest priority entering the arbitration system, and the SACK line is clear, the processor asserts the corresponding BG line.

3. The controller removes the BR4 signal and asserts SACK to acknowledge receipt of the BG4 signal.

4. The processor acknowledges SACK by removing BG4.

5. When BG4 transitions false the controller asserts BBSY, gaining control of the bus.

Once the controller has gained control of the bus by means of a BR requested, an interrupt can be generated as follows:

1. The controller places the vector address on the data lines and asserts INTR.

2. The processor delays 75 NS to deskew the data lines, then asserts SSYN.

3. The controller receives SSYN and clears INTR and BBSY from the bus. This constitutes active release of the bus to the processor.

4. The processor clears SSYN when INTR is cleared and enters the interrupt service routine specified by the vector address.

Note

Refer to paragraphs 2-3 and 2-4 for setup of alternate interrupt priority levels for the tape reader and tape punch.

4-4. TAPE READER CONTROL LOGIC.

The tape reader control logic utilizes the signals generated by the address selection logic to control device register/Unibus communications and control reader operation.

4-5. PRS Register.

The PRS register (address 177550) is a read/write register for transfer of control and status information between the master (processor) and slave (controller). Depending on the coding of C(1:0) by the master, a read or write operation is performed.

1. RDR ENB (D00): Setting the RDR ENB bit of the PRS register initiates Reader operations. This bit is a write only function. PRS·DATAIS·D00 generate RFC. RFC clears RDR FLAG (D06, DONE) and sets RDR RUN (D11, BUSY) to generate DRIVE RIGHT. RFC also triggers the end of tape one-shot (15ms).

2. RDR DIR (D01): READER DIRECTION determines the direction in which the perforated tape is to be read. A one (1) state in this location causes the tape to move from right to left. A zero (0) state in this location causes the tape to move from left to right.

3. RDR INT ENB (D06): Setting the RDR INT ENB bit of the PRS register enables the RDR FLAG or ERROR condition to cause an interrupt. This bit is a read/write function.

4. DONE (D07): The DONE bit is read only function. This bit contains the status of the RDR FLAG flip-flop. The RDR FLAG is reset by INIT + REC + PRB. RDR FLAG is set by RCLK which is generated by the amtiambiguity logic.

5. BUSY (D11): The BUSY bit is a read only function. This bit contains the status of the RDR RUN flip-flop. RDR RUN is set by RFC and reset by INIT or RCLK.

6. ERROR (D15): The ERROR bit is a read only function. This bit is set if the Reader does not respond with a new character within approximately 15ms after RDR ENB is set.

4-6. PRB Register.

The tape reader buffer logic consists of an 8-bit data latch and associated gating that compose the PRB register. As the tape moves in the forward direction and a new sprocket hole is detected, the data channels are strobed into the reader buffer latch. Referencing the PRB register gates the reader buffer onto the Unibus data lines, and clears the RDR FLAG. The PRB is a read only register.

4-7. TAPE READER SYSTEM OVERVIEW.

Tape reader operation is initiated with an instruction such as MOV #1, PRS. This sets the RDR ENB bit of the PRS register. The Controller is initialized and tape motion starts. As the tape motion continues the next sprocket hole strobes the reader data into the reader buffer and sets RDR FLAG (DONE bit of PRS). If RCLK is not generated within 15 MS of setting RDR ENB, the ERROR bit of PRS is set. This condition could exist if there was no tape in the Reader or the end of tape had just passed over the photohead.

4-8. TAPE PUNCH CONTROL LOGIC.

The tape punch control logic utilizes the signals generated by the address selection logic to control device register/Unibus communications and control tape punch operation.

4-9. PPS Register.

The PPS register (address 177554) is a read/write register for transfer of control and status information between the master (processor) and slave

(controller). Depending on the coding of C (1, 0) by the master, a read or write operation is performed.

1. PUN INT ENB (D 06): Setting the PUN INTO ENB bit of the PPS register enables the PUN FLAG or ERROR condition to cause an interrupt. This bit is a read/write function.

2. READY (D 07): The READY bit is a read only function. This bit contains the status of the PUN FLAG flip-flop. The PUN FLAG is set by INIT, cleared by referencing the PPB register, and set when punching is complete.

3. ERROR (D15): The ERROR bit is a read only function. This bit is set if the Punch does not respond with a punch operation complete within approximately 250 MS from the time of referencing the PPB register.

4-10. PPB Register.

The tape punch buffer logic consists of an 8-bit data latch and associated gating that compose the PPB register. Referencing the PPB with an instruction that could modify its contents, such as a MOV instruction, initiates the punching operation. The signal PPB is generated in the address selection logic. PPB sets PUN RUN, resets PUN FLAG, triggers the 250 MS ERROR one-shot and generates a 150 μsec punch command. The PPB register is a write only register.

4-11. TAPE PUNCH SYSTEM OVERVIEW.

Tape punch operation is initiated by referencing the PPB register, i.e., MOV DATA, PPB. As soon as the PPB register is referenced the data is placed on the Punch data lines. After a 1 μS delay, a 150 μsec punch command is transmitted to the tape punch. The PUN RUN flip-flop is set and the PUN FLAG is cleared. The 250 MS ERROR one-shot is triggered. When the punching process is complete, the PUN FLAG is set (READY D07). If the PUN FLAG is not set within 250 MS of referencing the PPB register, the ERROR bit in PPS register is set. This condition can exist when the tape punch is out of tape or has no power.

SECTION V

PUNCHED TAPE DIAGNOSTIC PROGRAM DESCRIPTION

5-1. SCOPE.

This diagnostic program tests the operational characteristics of the Tape Reader/Punch Controller (controller) with the Digital Equipment Corporation PDP-11 Computer. The program is furnished on a punched paper tape in absolute binary format. A special test tape is also provided.

5-2. SPECIAL HARDWARE REQUIREMENTS.

The diagnostic program requires a PDP-11 Computer with a minimum of 4K (words) of memory and a Console Teletype.

5-3. SPECIAL TEST TAPE.

This tape, illustrated in Figure 5-1, is used to sequence the equipment through all possible code combinations. It uses a binary count routine to sequentially count from "0" through 377_8. The tape may consist of one or more complete number blocks formed into a loop.

The tape can be spliced anywhere as long as the count is in sequence. The best place to splice is where there is least change, as illustrated in Figure 5-1. The spacing of the splice must be such that the count is not interrupted because of spacing or for any other reason. Refer to the tape reader/punch instruction manuals for the correct way to splice tape.

For tape movement from right-to-left, the tape is installed as illustrated in Figure 5-1. For tape movement from left-to-right, the tape must be turned inside out and installed so that the count increases from left-to-right.

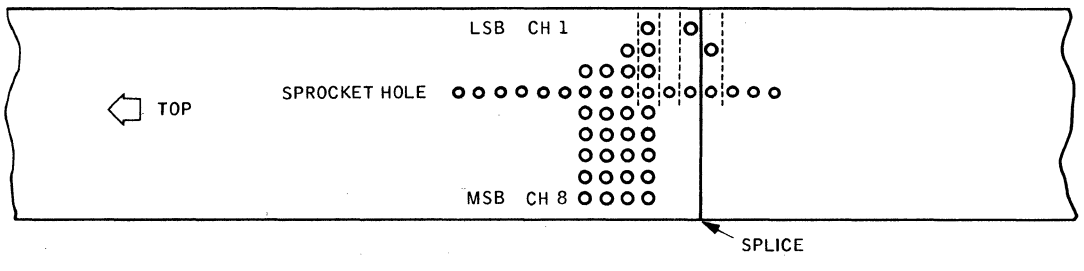


Figure 5-1. Special Test Tape Splice Information

5-4. LOADING PROCEDURE.

The absolute loader is used to load the diagnostic program. The program is intended to exercise the tape reader/punch system; therefore, to ensure a proper program load, use the low speed reader on the Console Teletype. The diagnostic program tape is loaded in the following manner.

1. Load the Bootstrap Loader program via the Console Switch Register.

2. Load the Absolute Loader.

3. Load the Paper Tape Controller Diagnostic Program.

4. Refer to the Console Users Manual for proper usage of the Bootstrap and Absolute Loaders.

5-5. STARTING PROCEDURE.

The controls and operations used in this procedure are described in Chapter 8 of the PDP-11 Processor Handbook. To start the diagnostic program, perform the following procedure.

1. Place the HALT/ENABLE switch to HALT.

2. Place 000200 octal in the switch register, for Reader Diagnostics. Place 000400 octal in the switch register for Punch Diagnostics.

3. Press LOAD ADDRESS switch.

4. Place the HALT/ENABLE switch to ENABLE.

5. Turn on the tape equipment to be tested. Place the special test tape in the tape reader.

6. Press the START key.

5-6. TAPE READER PROGRAM DESCRIPTION.

The program is divided into four parts: (1) Test the Reader Status Register, (2) Test the Reader Data Register, (3) Interrupt and Priority Tests, and (4) Reader Reliability Tests.

The program will execute each section sequentially until all tests are completed. If an error is detected in any test, an error message will be typed on the console teletype, and the "scope mode" will be entered. In the "scope mode" the program will loop on the test routine where the defect occurred for troubleshooting purposes. The computer will loop indefinitely on this routine with no possible exit until the proper operation takes place.

The program requires approximately five minutes to reach the tape reader reliability tests. The reliability test has a switch register option. If switch register 00 is down the routine will read 65536 characters in block lengths with random stalls. This requires approximately five minutes. If switch register 00 is up the routine will run until stopped by the operator.

5-7. TAPE PUNCH PROGRAM DESCRIPTION.

The program is divided into three parts: (1) Test the Tape Punch Status Register, (2) Interrupt and Priority Tests, (3) Tape Punch Reliability Tests.

The program will execute each section sequentially until all tests are completed. If an error is detected in any test, an error message will be typed on the console teletype, and the "scope mode" will be entered. In the "scope mode" the program will loop on the test routine where the defect occurred for troubleshooting purposes. The computer will loop indefinitely on this routine with no possible exit until the proper operation takes place.

The Tape Punch Program has no switch register options.

Error Message - Routine Location Table

Error Message	Mem. Add.
PROCESSOR TRAPPED WHEN REFERENCING THE PPS	10314
BIT 6 OF PPS FAILED TO SET	10410
BIT 6 OF PPS FAILED TO CLEAR	10514
BIT 6 OF PPS WAS NOT CLEARED BY RESET INSTRUCTION	10640
BIT 7 OF PPS DID NOT SET AFTER RESET INSTRUCTION	10744
BIT 7 OF PPS DID NOT RESET BY LOADING PUNCH BUFFER	11064
PROCESSOR TRAPPED WHEN REFERENCING PPB	11174
PUNCH FAILED TO CAUSE AN INTERRUPT	11306
PUNCH DID NOT INTERRUPT	11442

Error Message - Routine Location Table (Continued)

Error Message	Mem. Add.
PUNCH CAUSED AN INTERRUPT AFTER AN RTI INSTRUCTION	11550
PUNCH PRIORITY INTERRUPT FAILURE	15644
PRIORITY INTERRUPT FAILURE WITH PUNCH	12020
PROCESSOR TRAPPED WHEN REFERENCING THE PRS	2322
ERROR BIT DID NOT CLEAR WITH TAPE IN READER	2434
BIT 6 OF PRS FAILED TO SET	2530
BIT 6 OF PRS FAILED TO CLEAR	2644
BIT 6 OF PRS WAS NOT CLEARED BY RESET INSTRUCTION	2776
DONE BIT (BIT 7) DID NOT SET AFTER 100 MS	3064
DONE BIT DID NOT SET IN PRS	3252
BIT 7 WAS NOT CLEARED BY THE RESET INSTRUCTION	3310
DONE BIT (BIT 7) OF PRS DID NOT CLEAR ON ENABLE	3404
REFERENCING READER BUFFER DID NOT CLEAR DONE BIT	3574
READER ENABLE DID NOT SET BUSY BIT (11) OF PRS	3674
DATA ERROR	4150
PROCESSOR TRAPPED REFERENCING READER BUFFER	4276
READER BUFFER DID NOT CLEAR WITH READER ENABLE	4434
READER ERROR	2056
READER FAILED TO INTERRUPT	4552
PRIORITY INTERRUPT FAILURE	4754
PRIORITY FAILURE WITH INTERRUPT	5066

5-8. DIAGNOSTIC PROGRAM PRINTOUT.

The entire punched tape diagnostic program is printed out and included in this section.

```
                ;EQUATE STATEMENTS

177570          SR=177570           ;SWITCH REGISTER ADDRESS
177776          CC=177776
177776          PSW=177776          ;PS ADDRESS
001200          SPBOT=1200          ;BOTTOM OF STACK
000240          NOP=240
000000          OPEN=0
100000          BIT15=100000
040000          BIT14=40000
020000          BIT13=20000
010000          BIT12=10000
004000          BIT11=4000
002000          BIT10=2000
001000          BIT9=1000


000400          BIT8=400
000200          BIT7=200
000100          BIT6=100
000040          BIT5=40
000020          BIT4=20
000010          BIT3=10
000004          BIT2=4
000002          BIT1=2
000000          BIT0=0
100000          HLTSW=BIT15
040000          SCOPSW=BIT14
020000          NPRTSW=BIT13
010000          NTRCSW=BIT12
004000          NITRSW=BIT11
002000          LPRGSW=BIT10
001000          SRTSW=BIT9
000400          BYPMAN=BIT8
100000          MANUAL=BIT15
005726          PIPSP=5726
022626          PIPSP2=022626
000340          PRTY7=340
000300          PRTY6=300
000240          PRTY5=240
000200          PRTY4=200
000140          PRTY3=140
000100          PRTY2=100
000040          PRTY1=40
000000          PRTY0=0
104000          TYPE=EMT+0
104001          SCOPE=EMT+1
104002          STALL=EMT+2
104003          ERROR=EMT+3
104004          ERROR1=EMT+4
104005          CHALT=EMT+5
104006          STRDRV=EMT+6
104007          STPCHV=EMT+7
104010          EHALT=EMT+10
104011          SRESET=EMT+11
104400          DELAY=TRAP+0
000007          BELL=007
```

```
        000000                  .=0
000000  000002                  .+2             ;UNASSIGNED TRAP
000002  000000                  HALT
000004  000006          MACHER: .+2
000006  000000                  HALT
000010  000012                  .+2
000012  000000                  HALT
000014  000016                  .+2             ;TRACE TRAP
000016  000000                  HALT
000020  000022                  .+2             ;TRAP TO CALL IOX
000022  000000                  HALT
000024  000026                  .+2             ;POWER FAIL TRAP
000026  000000                  HALT
000030  001472                  EMTINT          ;EMT TRAP
000032  000340                  PRTY7
000034  001526                  TRPINT          ;TRAP--TRAP---SIMILER TO
000036  000000                  PRTY0
000040  000042                  .+2
000042  000000                  HALT
000044  000046          .+2
000046  000000          HALT
000050  000052          .+2
000052  000000          HALT
000054  000056          .+2
000056  000000          HALT
000060  000062          .+2
000062  000000          HALT
000064  000066          .+2
000066  000000          HALT
000070  000072          .+2
000072  000000          HALT
000074  000076          .+2
000076  000000          HALT
000100  000102          .+2
000102  000000          HALT
000104  000106          .+2
000106  000000          HALT
000110  000112          .+2
000112  000000          HALT
000114  000116          .+2
000116  000000          HALT
000120  000122          .+2
000122  000000          HALT
000124  000126          .+2
000126  000000          HALT
000130  000132          .+2
000132  000000          HALT
```

```
000134 000136          .+2
000136 000000          HALT
000140 000142          .+2
000142 000000          HALT
000144 000146          .+2
000146 000000          HALT
000150 000152          .+2
000152 000000          HALT
000154 000156          .+2
000156 000000          HALT
000160 000162          .+2
000162 000000          HALT
000164 000166          .+2
000166 000000          HALT
000170 000172          .+2
000172 000000          HALT
000174 000176          .+2
000176 000000          HALT
000200 000202          .+2
000202 000000          HALT
000204 000206          .+2
000206 000000          HALT
000210 000212          .+2
000212 000000          HALT
000214 000216          .+2
000216 000000          HALT
000220 000222          .+2
000222 000000          HALT
000224 000226          .+2
000226 000000          HALT
000230 000232          .+2
000232 000000          HALT
000234 000236          .+2
000236 000000          HALT
000240 000242          .+2
000242 000000          HALT
000244 000246          .+2
000246 000000          HALT
000250 000252          .+2
000252 000000          HALT
000254 000256          .+2
000256 000000          HALT
000260 000262          .+2
000262 000000          HALT
000264 000266          .+2
000266 000000          HALT
000270 000272          .+2
000272 000000          HALT
000274 000276          .+2
000276 000000          HALT
000300 000302          .+2
000302 000000          HALT
000304 000306          .+2
000306 000000          HALT
000310 000312          .+2
000312 000000          HALT
000314 000316          .+2
```

```
000316 000000          HALT
000320 000322          .+2
000322 000000          HALT
000324 000326          .+2
000326 000000          HALT
000330 000332          .+2
000332 000000          HALT
000334 000336          .+2
000336 000000          HALT
000340 000342          .+2
000342 000000          HALT
000344 000346          .+2
000346 000000          HALT
000350 000352          .+2
000352 000000          HALT
000354 000356          .+2
000356 000000          HALT
000360 000362          .+2
000362 000000          HALT
000364 000366          .+2
000366 000000          HALT
000370 000372          .+2
000372 000000          HALT
000374 000376          .+2
000376 000000          HALT
000400 000402          .+2
000402 000000          HALT
000404 000406          .+2
000406 000000          HALT
000410 000412          .+2
000412 000000          HALT
000414 000416          .+2
000416 000000          HALT
000420 000422          .+2
000422 000000          HALT
000424 000426          .+2
000426 000000          HALT
000430 000432          .+2
000432 000000          HALT
000434 000436          .+2
000436 000000          HALT
000440 000442          .+2
000442 000000          HALT
000444 000446          .+2
000446 000000          HALT
000450 000452          .+2
000452 000000          HALT
000454 000456          .+2
000456 000000          HALT
000460 000462          .+2
000462 000000          HALT
000464 000466          .+2
000466 000000          HALT
000470 000472          .+2
000472 000000          HALT
000474 000476          .+2
000476 000000          HALT
```

```
000500 000502          .+2
000502 000000          HALT
000504 000506          .+2
000506 000000          HALT
000510 000512          .+2
000512 000000          HALT
000514 000516          .+2
000516 000000          HALT
000520 000522          .+2
000522 000000          HALT
000524 000526          .+2
000526 000000          HALT
000530 000532          .+2
000532 000000          HALT
000534 000536          .+2
000536 000000          HALT
000540 000542          .+2
000542 000000          HALT
000544 000546          .+2
000546 000000          HALT
000550 000552          .+2
000552 000000          HALT
000554 000556          .+2
000556 000000          HALT
000560 000562          .+2
000562 000000          HALT
000564 000566          .+2
000566 000000          HALT
000570 000572          .+2
000572 000000          HALT
000574 000576          .+2
000576 000000          HALT
000600 000602          .+2
000602 000000          HALT
000604 000606          .+2
000606 000000          HALT
000610 000612          .+2
000612 000000          HALT
000614 000616          .+2
000616 000000          HALT
000620 000622          .+2
000622 000000          HALT
000624 000626          .+2
000626 000000          HALT
000630 000632          .+2
000632 000000          HALT
000634 000636          .+2
000636 000000          HALT
000640 000642          .+2
000642 000000          HALT
000644 000646          .+2
000646 000000          HALT
000650 000652          .+2
000652 000000          HALT
000654 000656          .+2
000656 000000          HALT
000660 000662          .+2
```

```
000662 000000          HALT
000664 000666          .+2
000666 000000          HALT
000670 000672          .+2
000672 000000          HALT
000674 000676          .+2
000676 000000          HALT
000700 000702          .+2
000702 000000          HALT
000704 000706          .+2
000706 000000          HALT
000710 000712          .+2
000712 000000          HALT
000714 000716          .+2
000716 000000          HALT
000720 000722          .+2
000722 000000          HALT
000724 000726          .+2
000726 000000          HALT
000730 000732          .+2
000732 000000          HALT
000734 000736          .+2
000736 000000          HALT
000740 000742          .+2
000742 000000          HALT
000744 000746          .+2
000746 000000          HALT
000750 000752          .+2
000752 000000          HALT
000754 000756          .+2
000756 000000          HALT
000760 000762          .+2
000762 000000          HALT
000764 000766          .+2
000766 000000          HALT
000770 000772          .+2
000772 000000          HALT
000774 000776          .+2
000776 000000          HALT
001000 001002          .+2
001002 000000          HALT
```

```
        000200          .=200
000200  000167          JMP START       ;GO TO START OF PROGRAM
        001210

        001204          .=.+1000
001204  177550          PRS:177550
001206  177552          PRB:177552      ;READER BUFFER
001210  177554          PPS:177554      ;PUNCH
001212  177556          PPB:    177556          ;PUNCH BUFFER
001214  000070          RDRVTR: 70              ;READER INTERRUPT VECTOR
001216  000200          RDRLVL: PRTY4           ;READER PRIORITY LEVEL
001220  000074          PCHVTR: 74              ;PUNCH INTERRUPT VECTOR
001222  000200          PCHLVL:PRTY4            ;PUNCH PRIORITY LEVEL
001224  177560          TKS:    177560          ;LSR CSR
001226  177562          TKB:    177562
001230  177564          TPS:    177564          ;LSP CSR
001232  177566          TPB:    177566          ;LSP BUFFER
001234  000060          TKVTR:  60              ;TTY INTERRUPT VECTOR
001236  000200          TKLVL:  PRTY4           ;TTY HAS PRIORITY LEVEL4
001240  000064          TPVTR:  64
001242  000200          TPLVL:  PRTY4
001244  000000          PRGNUM: 0
001246  000000          KSTART: 0
001250  000000          CURTST: 0
001252  000000          RTNNO:  0
001254  000000          NXTST:  0
001256  000000          ICTR:   0
001260  000000          SCOPTR: 0
001262  000000          PRGID:  0
001264  002210          PRGTAB: PRG0            ;PROGRAM TABLE
001266  002224                  PRG1
001270  002342                  PRG2
001272  002454                  PRG3
001274  002664                  PRG4
001276  003016                  PRG5
001300  003140                  PRG6
001302  003330                  PRG7
001304  003460                  PRG8
001306  003614                  PRG9
001310  004170                  PRG11
001312  003760                  PRG10
001314  004316                  PRG12
001316  004456          PRG20
001320  004630          PRG22
001322  004774          PRG23
001324  005136          PRG30
001326  005412          PRG31
001330  004454          PRG13
001332  001572          EMTTAB: TYP             ;POINTER TO TYPOUT ROUTI
001334  001672          SCOPE1
001336  002106          STAL
001340  002110          ERR
001342  002112          ERR1
001344  002114          CHLT
001346  001776          STPTRV
001350  002026          STPTPV
001352  002116          EHLT
```

```
001354 002120          SRSETT
001356 001730 TRPTAB:  DLY              ;START OF TRAP TABLE
001360 000000 ERRT:    0
001362 000000 RCNT:    0
001364 000000 CRBUF:   0
001366 000000 CHR1:    0
001370 000000 CHR2:    0
001372 000000 CHR3:    0
001374 000000 CHR1A:   0
001376 000000 CHR2A:   0
001400 000000 CHR3A:   0
001402 000000 ERCTR:   0
001404 000000 CTRA:    0
001406 000000 CTRB:    0
001410 000000 CTRC:    0
001412 000000 CTRD:    0


001414 012706 START:   MOV     #SPBOT,%6
       001200
001420 005067          CLR     PSW
       176352
001424 012767          MOV     #6,MACHER
       000006
       176352
001432 005000          CLR     %0               ;CLEAR REGISTER 0
001434 005067          CLR PRGNUM               ;CLEAR THE PROGRAM NUMBE
       177604
001440 104000          TYPE
001442 014335          CRLF
001444 104000          TYPE                     ;EMULATOR INSTRUCTION
001446 014205          TITLE                    ;TYPE THE PROGRAM TITLE
001450 016700 NXTPRG:  MOV     PRGNUM,%0        ;PUT THE PROGRAM NO. INB
       177570
001454 006100          ROL     %0               ;MULTIPLY BY 2
001456 000170          JMP     @PRGTAB(0)       ;GO EXECUTE THE TEST ROU
       001264
001462 062767 RETURN:  ADD     #1,PRGNUM
       000001
       177554
001470 000767          BR      NXTPRG           ;GO TO THE NEXT TEST PRO

               ;EMULATOR INTERPRETER

001472 011600 EMTINT:  MOV     @%6,%0
001474 162700          SUB     #2,%0
       000002
001500 121027          CMPB    @%0,#11
       000011
001504 101402          BLOS    EMTA
001506 000000          HALT
001510 000776          BR      .-2
001512 111001 EMTA:    MOVB    @%0,%1
001514 006101          ROL     %1
001516 042701          BIC     #177001,%1
       177001
001522 000171          JMP     @EMTTAB(1)
       001332
```

```
                ;TRAP INTERPRETER
001526 011646 TRPINT: MOV     @%6,-(6)
001530 162716         SUB     #2,@%6
       000002
001534 017616         MOV     @(6),@%6
       000000
001540 121627         CMPB    @%6,#0
       000000
001544 101402         BLOS    TRPA
001546 000000         HALT
001550 000776         BR      .-2
001552 006116 TRPA:   ROL     @%6
001554 042716         BIC     #177001,@%6
       177001
001560 062716         ADD     #TRPTAB,@%6
       001356

001564 017616         MOV     @(6),@%6
       000000
001570 000136         JMP     @(6)+

                ;SUBROUTINE TO OUTPUT ASCII MESSAGE
                ;A PERIOD TERMINATES THE MESSAGE
                ;AND GIVES A CRLF

001572 011600 TYP:    MOV     @%6,%0
001574 062716         ADD     #2,@%6
       000002
001600 011000         MOV     @%0,%0          ;ADDRESS OF MESS TO BE
001602 112067 TYPA:   MOVB    (0)+,TYPDAT     ;GET A CHARACTER
       000062
001606 122767         CMPB    #56,TYPDAT      ;CHECK FOR PERIOD
       000056
       000054
001614 001013         BNE     TYPC            ;BRANCH IF NOT A PERIOD
001616 112767         MOVB    #15,TYPDAT
       000015
       000044
001624 004767         JSR     %7,TYPD         ;GO TYPE CHARACTER IN TH
       000022
001630 112767         MOVB    #12,TYPDAT
       000012
       000032
001636 004767         JSR     %7,TYPD
       000010
001642 000002         RTI
001644 004767 TYPC:   JSR     %7,TYPD
       000002
001650 000754         BR      TYPA
001652 116777 TYPD:   MOVB    TYPDAT,@TPB     ;OUTPUT CHARACTER TO PRI
       000012
       177352
001660 105777         TSTB    @TPS            ;WAIT FOR DONE FLAG
       177344
001664 100375         BPL     .-4
001666 000207         RTS     %7              ;RETURN
001670 000000 TYPDAT: 0
```

```
001672 011600 SCOPE1: MOV     @%6,%0
001674 011016         MOV     @%0,@%6
001676 105777         TSTB    @TKS
       177322
001702 100401         BMI     KEYTST
001704 000002         RTI
001706 117767 KEYTST: MOVB    @TKB,XKEY
       177314
       000012
001714 122767         CMPB    #256,XKEY
       000256
       000004
001722 001657         BEQ     RETURN
001724 000002         RTI
001726 000000 XKEY:   0
001730 011667 DLY:    MOV     @%6,DLCNT
       000040
001734 062716         ADD     #2,@%6
       000002
001740 017767         MOV     @DLCNT,DLCNT
       000030
       000026
001746 012767 DLYA:   MOV     #172,DLCTR
       000172
       000016
001754 005367         DEC     DLCTR
       000012
001760 001375         BNE     .-4
001762 005367         DEC     DLCNT
       000006
001766 001367         BNE     DLYA
001770 000002         RTI
001772 000000 DLCTR:  0
001774 000000 DLCNT:  0

              ;ROUTINE TO SET READER INTERRUPT VECTOR AND PRIORITY

001776 017667 STPTRV: MOV     @(6),STPRA+2
       000000
       000012
002004 062716         ADD     #2,@%6
       000002
002010 016701         MOV     RDRVTR,%1
       177200
002014 012721 STPRA:  MOV     #0,(1)+
       000000
002020 016721         MOV     RDRLVL,(1)+
       177172
002024 000002         RTI
002026 017667 STPTPV: MOV     @(6),STPPA+2
       000000
       000012
002034 062716         ADD     #2,@%6
       000002
002040 016701         MOV     PCHVTR,%1
       177154
```

```
002044 012721 STPPA:  MOV     #0,(1)+         ;SET VECTOR ADDRESS
       000000
002050 016721         MOV     PCHLVL,(1)+     ;SET PRIORITY
       177146
002054 000002         RTI
002056 105277 AREAD:  INCB    @PRS            ;POKE READER
       177122
002062 005777 ARDA:   TST     @PRS
       177116
002066 100404         BMI     ARDB            ;BRANCH IF ERROR BIT SET
002070 105777         TSTB    @PRS            ;CHECK DONE BIT
       177110
002074 100372         BPL     ARDA            ;BRANCH IF NOT DONE
002076 000207         RTS     %7
002100 104000 ARDB:   TYPE
002102 015713         RERROR
002104 000764         BR      AREAD

                ;ROUTINES TO PUT IN LATER

002106 000002 STAL:   RTI
002110 000002 ERR:    RTI
002112 000002 ERR1:   RTI
002114 000002 CHLT:   RTI
002116 000002 EHLT:   RTI
002120 012700 SRSETT: MOV     #52525,%0
       052525
002124 005100         COM     %0
002126 010067         MOV     %0,SRSETT+2
       177770
002132 000005         RESET
002134 000002         RTI
002136 016700 RNGEN:  MOV     RP1,%0
       000042
002142 006100         ROL     %0
002144 006100         ROL     %0
002146 066700         ADD     RP2,%0
       000034
002152 010067         MOV     %0,RP1
       000026
002156 006100         ROL     %0
002160 006100         ROL     %0
002162 066700         ADD     RP2,%0
       000020
002166 006100         ROL     %0
002170 006100         ROL     %0
002172 010067         MOV     %0,RP2
       000010
002176 016700         MOV     RP1,%0
       000002
002202 000207         RTS     %7
002204 001233 RP1:    1233
002206 007622 RP2:    7622
```

```
                ;PROGRAM #1--TEST THE READER STATUS WORD

                ;TEST A--REFERENCE TEST WORD WITHOUT ERROR TRAP

002210 104000 PRG0:   TYPE
002212 014270         MESS1             ;TEST #1--TEST THE READER STATUS
002214 104000         TYPE
002216 014335         CRLF              ;GIVE A CARRIAGE RETURN LINE FEED
002220 000167         JMP RETURN
       177236
002224 012767 PRG1:   MOV     #-1000,RTNNO
       177000
       177020
002232 005067         CLR     SCOPTR
       177022
002236 012767 PRILP:  MOV     #ATOE,MACHER    ;SET UP MACHINE ERROR TR
       002304
       175540
002244 005777         TST     @PRS            ;REFERENCE THE PRS
       176734
002250 022767         CMP     #0,SCOPTR       ;SEE IF IN SCOPE MODE
       000000
       177002
002256 001402         BEQ     CONT1
002260 104001         SCOPE
002262 002236         PRILP
002264 005267 CONT1:  INC     RTNNO           ;BUMP THE LOOP COUNTER
       176762
002270 022767         CMP     #0,RTNNO
       000000
       176754
002276 001357         BNE     PRILP           ;NOT DONE YET
002300 002167         JMP     RETURN
       177156
002304 022767 ATOE:   CMP     #0,SCOPTR       ;SEE IF FIRST ERROR PASS
       000000
       176746
002312 001351         BNE     PRILP           ;IF BEEN HERE--FORGET IT
002314 104000         TYPE
002316 016243         ERRMSG
002320 104000         TYPE
002322 014336         ER1
002324 104000         TYPE
002326 015754         SCOPIN
002330 104000         TYPE
002332 014335         CRLF
002334 005267         INC     SCOPTR          ;SET THE SCOPE FLAG
       176720
002340 000736         BR      PRILP
```

```
                ;TEST B--TEST ERROR BIT

002342 012767 PRG2:   MOV #-1000,RTNNO        ;SET THE LOOP COUNT
       177000
       176702
002350 005067         CLR     SCOPTR          ;CLEAR THE SCOPE FLAG
       176704

002354 005777 PR2LP:  TST     @PRS            ;TEST THE PRS
       176624
002360 100416         BMI     AT5E            ;BRANCH IF ERROR BIT SE
002362 022767         CMP     #0,SCOPTR       ;SEE IF IN SCOPE MODE
       000000
       176670
002370 001402         BEQ     CONT2
002372 104001         SCOPE
002374 002354         PR2LP
002376 005267 CONT2:  INC     RTNNO           ;BUMP COUNT
       176650
002402 022767         CMP     #0,RTNNO        ;SEE IF COUNT DONE
       000000
       176642
002410 001361         BNE     PR2LP
002412 000167         JMP     RETURN          ;ALL DONE--GO TO NEXT R
       177044
002416 022767 AT5E:   CMP     #0,SCOPTR
       000000
       176634
002424 001353         BNE     PR2LP
002426 104000         TYPE
002430 016243         ERRMSG
002432 104000         TYPE
002434 014411         ER2
002436 104000         TYPE
002440 015754         SCOPIN
002442 104000         TYPE
002444 014335         CRLF
002446 005267         INC     SCOPTR
       176606
002452 000740         BR      PR2LP
```

```
                ;PROGRAM C--SET AND CLEAR INTERRUPT ENABLE

002454 012767 PRG3:   MOV     #-1000,RTNNO
       177000
       176570
002462 005067         CLR     SCOPTR
       176572
002466 012767 PR3LP:  MOV     #PRTY7,PSW
       000340
       175302
002474 052777         BIS     #BIT6,@PRS
       000100
       176502
002502 032777         BIT     #BIT6,@PRS
       000100
       176474
002510 001017         BNE     AT6B
002512 022767 AT6E1:  CMP     #0,SCOPTR       ;ERROR
       000000
       176540
002520 001362         BNE     PR3LP
002522 104000         TYPE
002524 016243         ERRMSG
002526 104000         TYPE


002530 014465         ER3
002532 104000         TYPE
002534 015754         SCOPIN
002536 104000         TYPE
002540 014335         CRLF
002542 005267         INC     SCOPTR
       176512
002546 000747         BR      PR3LP
002550 042777 AT6B:   BIC     #BIT6,@PRS
       000100
       176426
002556 032777         BIT     #BIT6,@PRS
       000100
       176420
002564 001016         BNE     LT6E2
002566 022767         CMP     #0,SCOPTR
       000000
       176464
002574 001402         BEQ     CONT3
002576 104001         SCOPE
002600 002466         PR3LP
002602 005267 CONT3:  INC     RTNNO
       176444
002606 022767         CMP     #0,RTNNO
       000000
       176436
002614 001324         BNE     PR3LP
002616 000167         JMP     RETURN
       176640
```

```
002622 022767 LT6E2:  CMP     #0,SCOPTR
       000000
       176430
002630 001316         BNE     PR3LP
002632 104000         TYPE
002634 016243         ERRMSG
002636 104000         TYPE
002640 016243         ERRMSG
002642 104000         TYPE
002644 014520         ER3A
002646 104000         TYPE
002650 015754         SCOPIN
002652 104000         TYPE
002654 014335         CRLF
002656 005267         INC     SCOPTR
       176376
002662 000701         BR      PR3LP           ;GO LOOP IN ROUTINE
                ;TEST D--CLEAR BIT6 WITH RESET INSTRUCTION

002664 012767 PRG4:   MOV     #-1000,RTNNO
       177000
       176360
002672 005067         CLR     SCOPTR
       176362
002676 012767 PR4LP:  MOV     #PRTY7, PSW
       000340
       175072
002704 052777 AT7A:   BIS     #BIT6,@PRS
       000100
       176272
002712 104011         SRESET
002714 032777         BIT     #BIT6,@PRS
       000100
       176262
002722 001016         BNE     AT7E
002724 022767 AT7B:   CMP     #0,SCOPTR
       000000
       176326
002732 001402         BEQ     CONT4
002734 104001         SCOPE
002736 002676         PR4LP
002740 005267 CONT4:  INC     RTNNO
       176306
002744 022767         CMP     #0,RTNNO
       000000
       176300
002752 001351         BNE     PR4LP
002754 000167         JMP     RETURN
       176502
002760 022767 AT7E:   CMP     #0,SCOPTR
       000000
       176272
```

```
002766 001343          BNE     PR4LP
002770 104000          TYPE
002772 016243          ERRMSG
002774 104000          TYPE
002776 014555          ER4
003000 104000          TYPE
003002 015754          SCOPIN
003004 104000          TYPE
003006 014335          CRLF
003010 005267          INC     SCOPTR
       176244
003014 000730          BR      PR4LP
                ;TEST E--TEST THAT DONE BIT COMES UP AFTER 100 MS DELAY

003016 012767 PRG5:    MOV     #-4000,RTNNO
       174000
       176226
003024 005067          CLR     SCOPTR
       176230
003030 005277 AT10A:   INC     @PRS            ;POKE THE READER
       176150


003034 104400          DELAY                   ;DELAY 100 MS
003036 000144          100.
003040 105777          TSTB    @PRS
       176140
003044 100417          BMI     AT10B
003046 022767 AT10E:   CMP     #0,SCOPTR       ;ERROR--FLAG DIDNT COMEB
       000000
       176204
003054 001365          BNE     AT10A
003056 104000          TYPE
003060 016243          ERRMSG
003062 104000          TYPE
003064 014630          ER5
003066 104000          TYPE
003070 015754          SCOPIN
003072 104000          TYPE
003074 014335          CRLF
003076 005267          INC     SCOPTR
       176156
003102 000752          BR      AT10A
003104 022767 AT10B:   CMP     #0,SCOPTR
       000000
       176146
003112 001402          BEQ     CONT5
003114 104001          SCOPE
003116 003030          AT10A
003120 005267 CONT5:   INC     RTNNO
       176126
003124 022767          CMP     #0,RTNNO
       000000
       176120
003132 001336          BNE     AT10A
003134 000167          JMP     RETURN
       176322
```

```
                        ;TEST F--TEST THAT RESET COMMAND CLEARS DONE BIT

003140 012767 PRG6:     MOV     #-1000,RTNNO
       177000
       176104
003146 005067           CLR     SCOPTR
       176106
003152 005277 PR6LP:    INC     @PRS
       176026
003156 104400           DELAY
003160 000024           20.
003162 105777           TSTB    @PRS
       176016
003166 100022           BPL     AT12E1
003170 000005           RESET
003172 105777           TSTB    @PRS
       176006
003176 100435           BMI     AT12E2
003200 022767           CMP     #0,SCOPTR
       000000
       176052
003206 001402           BEQ     CONT6

003210 104001           SCOPE
003212 003152           PR6LP
003214 005267 CONT6:    INC     RTNNO
       176032
003220 022767           CMP     #0,RTNNO
       000000
       176024
003226 001351           BNE     PR6LP
003230 000167           JMP     RETURN
       176226
003234 022767 AT12E1:   CMP     #0,SCOPTR
       000000
       176016
003242 001343           BNE     PR6LP
003244 104000           TYPE
003246 016243           ERRMSG
003250 104000           TYPE
003252 014702           ER6
003254 104000           TYPE
003256 015754           SCOPIN
003260 104000           TYPE
003262 014335           CRLF
003264 005267           INC     SCOPTR
       175770
003270 000730           BR      PR6LP
003272 022767 AT12E2:   CMP     #0,RTNNO
       000000
       175752
003300 001324           BNE     PR6LP
003302 104000           TYPE
003304 016243           ERRMSG
003306 104000           TYPE
003310 014736           ER6A
003312 104000           TYPE
003314 015754           SCOPIN
003316 104000           TYPE
003320 014335           CRLF
003322 005267           INC     SCOPTR
       175732
003326 000711           BR      PR6LP
```

```
                ;TEST G--TEST THAT THE DONE BIT IS CLEARED WHEN ENABLIN
  003330 012767 PRG7:   MOV     #-1000,RTNNO
         177000
         175714
  003336 005067         CLR     SCOPTR
         175716
  003342 005277 PR7LP:  INC     @PRS            ;POKE THE READER
         175636
  003346 105777         TSTB    @PRS            ;SET THE DONE BIT
         175632
  003352 100375         BPL     .-4
  003354 005277         INC     @PRS            ;POKE THE READER AGAIN
         175624
  003360 105777         TSTB    @PRS
         175620
  003364 100017         BPL     AT13B
.MAIN.MACRO VR05A  PAGE 5+


  003366 022767 AT13E:  CMP     #0,SCOPTR
         000000
         175664
  003374 001362         BNE     PR7LP
  003376 104000         TYPE
  003400 016243         ERRMSG
  003402 104000         TYPE
  003404 015015         ER7
  003406 104000         TYPE
  003410 015754         SCOPIN
  003412 104000         TYPE
  003414 014335         CRLF
  003416 005267         INC     SCOPTR
         175636
  003422 000747         BR      PR7LP
  003424 022767 AT13B:  CMP     #0,SCOPTR
         000000
         175626
  003432 001402         BEQ     CONT7
  003434 104001         SCOPE
  003436 003342         PR7LP
  003440 005267 CONT7:  INC     RTNNO
         175606
  003444 022767         CMP     #0,RTNNO
         000000
         175600
  003452 001333         BNE     PR7LP
  003454 000167         JMP RETURN
         176002
```

```
                ;TEST H--TEST THAT DONE BIT IS CLEARED
                ;  BY REFERENCING READER BUFFER

003460 012767 PRG8:   MOV     #-1000,RTNNO
       177000
       175564
003466 005067         CLR     SCOPTR
       175566
003472 005277 PR8LP:  INC     @PRS
       175506
003476 105777         TSTB    @PRS
       175502
003502 100375         BPL     .-4
003504 005777         TST     @PRB
       175476
003510 105777         TSTB    @PRS
       175470
003514 100416         BMI     AT14E1
003516 022767         CMP     #0,SCOPTR
       000000
       175534
003524 001402         BEQ     CONT8
003526 104001         SCOPE
003530 003472         PR8LP
003532 005267 CONT8:  INC     RTNNO
       175514
003536 022767         CMP     #0,RTNNO
       000000
       175506
003544 001352         BNE     PR8LP
003546 000167         JMP     RETURN
       175710
003552 022767 AT14E1: CMP     #0,SCOPTR
       000000
       175500
003560 001344         BNE     PR8LP
003562 104000         TYPE
003564 016243         ERRMSG
003566 104000         TYPE
003570 016243         ERRMSG
003572 104000         TYPE
003574 015075         ER8
003576 104000         TYPE
003600 015754         SCOPIN
003602 104000         TYPE
003604 014335         CRLF
003606 005267         INC     SCOPTR
       175446
003612 000727         BR      PR8LP
```

```
                ;TESTI--TEST THAT BUSY BIT IS SET WHEN READER IS ENABLED
003614 012767 PRG9:   MOV     #-1000,RTNNO
       177000
       175430
003622 005067         CLR     SCOPTR
       175432
003626 104011 PR9LP:  SRESET

003630 005277         INC     @PRS
       175350
003634 105777         TSTB    @PRS
       175344
003640 100375         BPL     .-4
003642 005277         INC     @PRS
       175336
003646 032777         BIT     #BIT11,@PRS
       004000
       175330
003654 001017         BNE     AT15B
003656 022767 AT15E:  CMP     #0,SCOPTR
       000000
       175374
003664 001360         BNE     PR9LP
003666 104000         TYPE
003670 016243         ERRMSG
003672 104000         TYPE
003674 015156         ER9
003676 104000         TYPE
003700 015754         SCOPIN
003702 104000         TYPE
003704 014335         CRLF
003706 005267         INC     SCOPTR
       175346
003712 000745         BR      PR9LP
003714 022767 AT15B:  CMP     #0,SCOPTR
       000000
       175336
003722 001402         BEQ     CONT9
003724 104001         SCOPE
003726 003626         PR9LP
003730 005267 CONT9:  INC     RTNNO
       175316
003734 022767         CMP     #0,RTNNO
       000000
       175310
003742 001331         BNE     PR9LP
003744 104000         TYPE
003746 015562         PRSOK
003750 104000         TYPE
003752 014335         CRLF
003754 000167         JMP     RETURN
       175502
```

```
                ;TEST ABILITY TO READ THE READER BUFFER

 003760 104000 PRG10:  TYPE
 003762 014335         CRLF
 003764 012767         MOV     #-15,RTNNO
        177763
        175260
 003772 005067         CLR     SCOPTR
        175262
 003776 005277 PRG10P: INC     @PRS
        175202
 004002 105777         TSTB    @PRS
.MAIN.MACRO VR05A  PAGE 6+


        175176
 004006 100375         BPL     .-4
 004010 127727         CMPB    @PRB,#0
        175172
        000000
 004016 001401         BEQ     CONT10
 004020 000766         BR      PRG10P
 004022 005277 CONT10: INC     @PRS
        175156
 004026 105777         TSTB    @PRS
        175152
 004032 100375         BPL     .-4
 004034 117767         MOVB    @PRB,CHR1
        175146
        175324
 004042 005277         INC     @PRS
        175136
 004046 105777         TSTB    @PRS
        175132
 004052 100375         BPL     .-4
 004054 117767         MOVB    @PRB,CHR2
        175126
        175306
 004062 005267         INC     CHR1
        175300
 004066 126767         CMPB    CHR1,CHR2
        175274
        175274
 004074 001016         BNE     AT17E
 004076 022767         CMP     #0,SCOPTR
        000000
        175154
 004104 001402         BEQ     CNT10B
 004106 104001         SCOPE
 004110 003776         PRG10P
 004112 005267 CNT10B: INC     RTNNO
        175134
 004116 022767         CMP     #0,RTNNO
        000000
        175126
 004124 001324         BNE     PRG10P
 004126 000167         JMP     RETURN
        175330
```

```
004132 022767 AT17E:  CMP     #0,SCOPTR
       000000
       175120
004140 001316         BNE     PRG10P
004142 104000         TYPE
004144 016243         ERRMSG
004146 104000         TYPE
004150 015235         ER10
004152 104000         TYPE
004154 015754         SCOPIN
004156 104000         TYPE
004160 014335         CRLF
004162 005267         INC     SCOPTR

       175072
004166 000703         BR      PRG10P

                ;TEST ABILITY TO REFERENCE THE READER WITHOUT MACHINE TR

004170 104000 PRG11:  TYPE
004172 015403         MESS2
004174 104000         TYPE
004176 014335         CRLF
004200 012767         MOV     #-1000,RTNNO
       177000
       175044
004206 005067         CLR     SCOPTR
       175046
004212 012767 PRG11L: MOV     #AT1E,MACHER
       004260
       173564
004220 005777         TST     @PRB
       174762
004224 022767         CMP     #0,SCOPTR
       000000
       175026
004232 001402         BEQ     CONT11
004234 104001         SCOPE
004236 004212         PRG11L
004240 005267 CONT11: INC     RTNNO
       175226
004244 022767         CMP     #0,RTNNO
       000000
       175000
004252 001357         BNE     PRG11L
004254 000167         JMP     RETURN
       175202
004260 022767 AT1E:   CMP     #0,SCOPTR
       000000
       174772
004266 001351         BNE     PRG11L
004270 104000         TYPE
004272 016243         ERRMSG
004274 104000         TYPE
004276 015250         ER11
004300 104000         TYPE
004302 015754         SCOPIN
004304 104000         TYPE
004306 014335         CRLF
004310 005267         INC     SCOPTR
       174744
004314 000736         BR      PRG11L
```

```
                        ;TEST THAT READER BUFFER CLEARS WITH READER ENABLE

  004316 012767 PRG12:  MOV     #-1000,RTNNO
         177000
         174726
  004324 005067         CLR     SCOPTR
         174730
  004330 104011 PRG12L: SRESET
  004332 004767         JSR     %7,AREAD
.MAIN.MACRO VR05A  PAGE 6+


         175520
  004336 005777         TST     @PRB
         174644
  004342 001772         BEQ     PRG12L
  004344 005277         INC     @PRS
         174634
  004350 005777         TST     @PRB
         174632
  004354 000240         NOP     AT20E
  004356 022767 AT20B:  CMP     #0,SCOPTR
         000000
         174674
  004364 001402         BEQ     CONT20
  004366 104001         SCOPE
  004370 004330         PRG12L
  004372 005267 CONT20: INC     RTNNO
         174654
  004376 022767         CMP     #0,RTNNO
         000000
         174646
  004404 001351         BNE     PRG12L
  004406 104000         TYPE
  004410 015646         PRBOK
  004412 000167         JMP     RETURN
         175044
  004416 022767 AT20E:  CMP     #0,SCOPTR
         000000
         174634
  004424 001341         BNE     PRG12L
  004426 104000         TYPE
  004430 016243         ERRMSG
  004432 104000         TYPE
  004434 015324         ER12
  004436 104000         TYPE
  004440 015754         SCOPIN
  004442 104000         TYPE
  004444 014335         CRLF
  004446 005267         INC     SCOPTR
         174606
  004452 000726         BR      PRG12L
  004454 000000 PRG13:  HALT
```

```
                ;TEST THAT READER IS ABLE TO INTERRUPT AND GO TO CORREC@

004456 104000 PRG20:  TYPE
004460 015443         MESS3           ;TYPE "READER INTERRUPT AND PRI@
004462 104000         TYPE
004464 014335         CRLF
004466 012767         MOV     #-1000,RTNNO
       177000
       174556
004474 005067         CLR     SCOPTR
       174560
004500 104006 AT21:   STRDRV          ;SET THE READER INTERRUPT VECTOR
004502 004572         AT21B
004504 012767         MOV     #PRTY0,PSW      ;SET PROCESSOR PRIORITY@
       000000
       173264
004512 042777         BIC     #BIT6,@PRS      ;DISABLE READER INTERRU@
       000100
       174464
004520 004767         JSR     %7,AREAD
       175332
004524 052777         BIS     #BIT6,@PRS      ;ENABLE READER INTERRUPT
       000100
       174452
004532 000240         NOP
004534 022767 AT21E:  CMP     #0,SCOPTR
       000000
       174516
004542 001356         BNE     AT21
004544 104000         TYPE
004546 016243         ERRMSG
004550 104000         TYPE
004552 016056         ER20
004554 104000         TYPE
004556 015754         SCOPIN
004560 104000         TYPE
004562 014335         CRLF
004564 005267         INC     SCOPTR
       174470
004570 000743         BR      AT21
004572 022626 AT21B:  PIPSP2
004574 022767         CMP     #0,SCOPTR
       000000
       174456
004602 001402         BEQ     CONT21
004604 104001         SCOPE
004606 004503         AT21
004610 005267 CONT21: INC     RTNNO
       174436
004614 022767         CMP     #0,RTNNO
       000000
       174430
004622 001326         BNE     AT21
004624 000167         JMP     RETURN
       174632
```

```
004630 012767 PRG22:  MOV     #-1000,RTNNO
       177000
       174414
004636 005267         CLR     SCOPTR
       174416
004642 104406 AT22A:  STRDRV
004644 004734         AT22E
004646 016767         MOV     RDRLVL,PSW
       174344
       173122
004654 005077         CLR     @PRS            ;DISABLE INTERRUPT
       174324
004660 004767         JSR     %7,AREAD        ;READ A CHARACTER
       175172
004664 052777         BIS     #BIT6,@PRS      ;ENABLE READER INTERRUPT
       000100
       174312
004672 000240         NOP
004674 005077         CLR     @PRS            ;DISABLE READER INTERRUP
       174304
004700 022767         CMP     #0,SCOPTR
       000000
       174352
004706 001402         BEQ     CONT22
004710 104001         SCOPE
004712 004642         AT22A
004714 005267 CONT22: INC     RTNNO
       174332
004720 022767         CMP     #0,RTNNO
       000000
       174324
004726 001345         BNE     AT22A
004730 000167         JMP     RETURN
       174526
004734 022626 AT22E:  PIPSP2                  ;POP THE STACK
004736 022767         CMP     #0,SCOPTR
       000000
       174314
004744 001336         BNE     AT22A
004746 104000         TYPE
004752 016243         ERRMSG
004752 104000         TYPE
004754 016111         ER22
004756 104000         TYPE
004760 015754         SCOPIN
004762 104000         TYPE
004764 014335         CRLF
004766 005267         INC     SCOPTR
       174266
004772 000723         BR      AT22A
```

```
                ;TEST THAT READER INTERRUPTS WITH PROCESSOR AT PRIORITY
                ;LEVEL 1

  004774 012767 PRG23:  MOV     #-1000,RTNNO
         177000
         174250
.MAIN.MACRO VR05A  PAGE 7+


  005002 005067         CLR     SCOPTR
         174252
  005006 104006 PR23LP: STRDRV
  005010 005106         AT23B
  005012 016767         MOV     RDRLVL,PSW
         174200
         172756
  005020 162767         SUB     #40,PSW
         000040
         172750
  005026 042777         BIC     #BIT6,@PRS
         000100
         174150
  005034 004767         JSR     %7,AREAD
         175016
  005040 052777         BIS     #BIT6,@PRS
         000100
         174136
  005046 000240         NOP
  005050 022767         CMP     #0,SCOPTR       ;ERROR
         000000
         174202
  005056 001353         BNE     PR23LP
  005060 104000         TYPE
  005062 016243         ERRMSG
  005064 104000         TYPE
  005066 016144         ER23
  005070 104000         TYPE
  005072 015754         SCOPIN
  005074 104000         TYPE
  005076 014335         CRLF
  005100 005267         INC     SCOPTR
         174154
  005104 000740         BR      PR23LP
  005106 022626 AT23B:  PIPSP2
  005110 022767         CMP     #0,SCOPTR
         000000
         174142
  005116 001402         BEQ     CONT23
  005120 104001         SCOPE
  005122 005006         PR23LP
  005124 005267 CONT23: INC     RTNNO
         174122
  005130 001326         BNE     PR23LP
  005132 000167         JMP     RETURN
         174324
```

```
                ;READER RELIABILITY TESTS

005136 104000 PRG30:  TYPE
005140 015520         MESS4                    ;READER RELIABILITY TEST$
005142 005067         CLR       COUNT
       000240
005146 012767         MOV       #-24,COUNT1    ;SET TTY CHARACGER COUNT
       177754
       000234
005154 012777         MOV       #15,@TPB       ;ENABLE TTY PRINTER
       000015
       174050
005162 005277         INC       @PRS           ;ENABLE READER
       174016
005166 012700         MOV       #CHNPRT,%0     ;SET POINTER TO TTY MESG
       015730
005172 105777 GETIT:  TSTB      @PRS           ;SEE IF READER DONE
       174006
005176 100402         BMI       SETCNT
005200 000167         JMP       TYPIT
       000012
005204 005277 SETCNT: INC       @PRS           ;READER DONE--POKE IT
       173774
005210 005267         INC       COUNT          ;ALSO COUNT IT
       000172
005214 000766         BR        GETIT
005216 105777 TYPIT:  TSTB      @TPS           ;SEE IF PRINTER DONE
       174006
005222 100401         BMI       TTYP
005224 000762         BR        GETIT          ;PRINTER NOT READY--KEEP
005226 112077 TTYP:   MOVB      (0)+,@TPB      ;PRINTER READY--PRINT CH
       174000
005232 005267         INC       COUNT1
       000152
005236 001355         BNE       GETIT
005240 004767         JSR       %7,CONVT
       000010
005244 104000         TYPE
005246 016251         CPS
005252 000167         JMP       RETURN
       174206

005254 006067 CONVT:  ROR       COUNT          ;DIVIDE BY TWO
       000126
005260 016701 BDCNV:  MOV       COUNT,%1
       000122
 05264 012702         MOV       #ADTENP,%2
       005374
005270 012767         MOV       #5,CNVCTR
       000005
       000070
005276 012267 BDCNVA: MOV       (2)+,TENPWR
       000070
005302 004767         JSR       %7,SUBTEN
       000010
005306 005367         DEC       CNVCTR
       000054
```

```
005312 001371           BNE     BDCNVA
005314 000207           RTS     %7

005316 005067 SUBTEN:   CLR     DIGIT
       000046
005322 166701 SUBTNA:   SUB     TENPWR,%1
       000044
005326 103403           BCS     SUBTNB
005330 005267           INC     DIGIT
       000034
005334 000772           BR      SUBTNA
005336 066701 SUBTNB:   ADD     TENPWR,%1
       000030
005342 062767           ADD     #60,DIGIT
       000060
       000020
005350 116777           MOVB    DIGIT,@TPB
       000014
       173654
005356 105777           TSTB    @TPS
       173646
005362 100375           BPL     .-4
005364 000207           RTS     %7
005366 000000 CNVCTR:   0
005370 000000 DIGIT:    0
005372 000000 TENPWR:   0
005374 023420 ADTENP:   10000.
005376 001750           1000.
005400 000144           100.
005402 000012           10.
005404 000001           1
005406 000000 COUNT:    0
005410 000000 COUNT1:   0

005412 104000 PRG31:    TYPE
005414 016301           BINCT                   ;TYPE"BINARY COUNT ROUT@
005416 104000           TYPE
005420 014335           CRLF
005422 012767           MOV     #-607,CNTG1
       177171
       000374
005430 004767 RREAD:    JSR     %7,AREAD        ;GET A CHARACTER
       174422
005434 105777           TSTB    @PRB            ;SEE IF ZERO
       173546
005440 001373           BNE     RREAD           ;NO--KEEP READING UNTIL@
005442 005067           CLR     CNT             ;YES ZERO--CONTINUE
       000362
005446 005067           CLR     CNTG1           ; SET TO READ 131072 CH@
       000352
005452 016767 GO1:      MOV     SR,CNTG2        ; GET SR OPTION
       172112
       000346
005460 042767           BIC     #177776,CNTG2
       177776
       000340
005466 022767           CMP     #0,CNTG2
```

```
        000000
        000332
005474  001402          BEQ     GO1B
005476  005067          CLR     CNTG1
        000322
005502  004767  GO1B:    JSR     %7,RNGEN        ; FETCH BLOCK LENGTH
        174430
005506  042700          BIC     #177700,%0      ;77 CHAR LIMIT
        177700
005512  022700          CMP     #0,%0
        000000
005516  001755          BEQ     GO1
005520  010067          MOV     %0,BLKLEN
        000276
005524  004767  GO3:     JSR     %7,RNGEN        ;GET STALL TIME
        174406
005530  042700          BIC     #177700,%0
        177700
005534  022700          CMP     #0,%0
        000000
005540  001771          BEQ     GO3
005542  010067          MOV     %0,STALL1
        000250
005546  004767  GO2:     JSR     %7,AREAD
        174304
005552  005267          INC     CNTG1
        000246
005556  022767          CMP     #0,CNTG1
        000000
        000240
005564  001456          BEQ     ENDITX
005566  017767          MOV     @PRB,HSR
        173414
        000220
005574  005267          INC     CNT             ;INCREMENT CHARACTER COU
        000230
005600  042767          BIC     #177400,CNT
        177400
        000222
005606  026767          CMP     CNT,HSR
        000216
        000200
005614  001402          BEQ     CONT31
005616  000167          JMP     ERRN
        000034
005622  005367  CONT31:  DEC     BLKLEN          ;DECREMENT THE COUNT
        000174
005626  001347          BNE     GO2             ;NOT ENOUGH CHARACTERS
005630  005367  STALLA:  DEC     STALL1
        000162
005634  001706          BEQ     GO1
005636  012767          MOV     #-200,STALL2
        177600
        000154
005644  005267  STLOOP:  INC     STALL2
        000150
005650  001375          BNE     STLOOP
```

```
005652 000167          JMP STALLA
       177752

005656 104000 ERRN:    TYPE
005660 016223          TGOOD                    ;TYPE "DATA ERROR GOOD V
005662 016701          MOV     CNT,%1
       000142
005666 004767          JSR     %7,BINI
       000052
005672 104000          TYPE
005674 014335          CRLF
005676 104000          TYPE
005700 016204          TBAD
005702 016701          MOV     HSR,%1
       000106
005706 004767          JSR     %7,BINI          ;TYPE BAD BINARY PATTERN
       000032
005712 104000          TYPE
005714 014335          CRLF
005716 000167          JMP     RREAD
       177506
005722 104000 ENDITX:  TYPE
005724 014335          CRLF
005726 104000          TYPE
005730 016031          PRGENDS
005732 104000          TYPE
005734 014335          CRLF
005736 000000          HALT
005740 000167          JMP START
       173450


005744 005002 BINI:    CLR     %2
005746 012767          MOV     #-10,BINCNT
       177770
       000056
005754 042701          BIC     #177400,%1
       177400
005760 000301          SWAB    %1
005762 005002 BINGO:   CLR     %2
005764 006101          ROL     %1
005766 005502          ADC     %2
005770 062702          ADD     #260,%2
       000260
005774 010267          MOV     %2,TYPDAT
       173670
006000 004767          JSR     %7,TYPD
       173646
006004 005267          INC     BINCNT
       000022
006010 001364          BNE     BINGO
006012 000207          RTS     %7
006014 000000 HSR:     0
006016 000000 STALL1:  0
006020 000000 STALL2:  0
006022 000000 BLKLEN:  0
006024 000000 CNTG1:0
006026 000000 CNTG2:0
006030 000000 CNT:     0
006032 000000 BINCNT:  0
```

```
                ;START OF PUNCH TEST PROGRAM

        000400          .=400
000400  000167          JMP STARTP              ;GO TO PUNCH PROGRAM
        007474

        010100          .=10100

010100  012706  STARTP: MOV     #SPBOT,%6       ;SET PUSHDOWN STACK
        001200
010104  005067          CLR     PSW
        167666
010110  012767          MOV     #6,MACHER       ;SET MACHINE ERROR TRAP
        000006
        167666
010116  005000          CLR     %0
010120  005067          CLR     PRGNUM          ;CLEAR THE PROGRAM NUMBE
        171120
010124  104000          TYPE
010126  014335          CRLF
010130  104000          TYPE
010132  012665          TITLEP

010134  016700  NEWPRO: MOV     PRGNUM,%0
        171104
010140  006100          ROL     %0              ;MULTIPLY BY TWO
010142  000170          JMP     @PRGLST(0)      ;GO EXECUTE THE TEST
        010156

010146  062767  EXIT:   ADD     #1,PRGNUM
        000001
        171070
010154  000767          BR      NEWPRO

010156  010210  PRGLST: ROUT0                   ;TYPE "TEST #1--TEST PU
010160  010224          ROUT1                   ;MACHINE TRAP ON PPS
010162  010334          ROUT2                   ;SET AND CLEAR BIT 6
010164  010534          ROUT3                   ;CLEAR BIT 6 WITH RESET
010166  010660          ROUT4                   ;SET BIT 7
010170  011104          ROUT6                   ;MACHINE TRAP ON PPB LO
010172  010764          ROUT5                   ;BIT 7 SET WHEN LOADINGB
010174  011214          ROUT7                   ;INTERRUPT TEST
010176  011360          ROUT8                   ;NO INTERRUPT AFTER RTI
010200  011570          ROUT9                   ;PRIORITY
010202  011726          ROUT10          ;PRIORITY
010204  012070          ROUT30                  ;PUNCH SPEED
010206  012216          ROUT31                  ;BINARY PUNCH

010210  104000  ROUT0:  TYPE
010212  012710          MESP1                   ;TEST #1--TEST PUNCH ST
010214  104000          TYPE
010216  014335          CRLF
010220  000167          JMP     EXIT
        177722
```

```
                ;TEST A--REFERENCE TEST WORD WITHOUT ERROR TRAP

010224 012767 ROUT1:  MOV     #-1000,RTNNO
       177000
       171020
010232 005067         CLR     SCOPTR
       171022
010236 012767 PNCH1L: MOV     #RTIE,MACHER      ;SET UP MACHINE ERROR
       010276
       167540
010244 005777         TST     @PPS              ;REFERENCE PUNCH STATUS
       170740
010250 022767         CMP     #0,SCOPTR
       000000
       171002
010256 001402         BEQ     GOP1
010260 104001         SCOPE
010262 010236         PNCH1L
010264 005267 GOP1:   INC     RTNNO
       170762
010270 001362         BNE     PNCH1L            ;NOT DONE YET
010272 000167         JMP EXIT
       177650
010276 022767 RTIE:   CMP     #0,SCOPTR
       000000
       170754
010304 001354         BNE     PNCH1L
010306 104000         TYPE
010310 016243         ERRMSG
010312 104000         TYPE
010314 012750         PER1                      ;MACHINE TRAPPED WHEN
010316 104000         TYPE                      ;REFERENCING THE PPS
010320 015754         SCOPIN
010322 104000         TYPE
010324 014335         CRLF
010326 005267         INC     SCOPTR
       170726
010332 000741         BR      PNCH1L
```

```
                ;TEST ABILITY TO SET AND CLEAR ID BIT (6) IN PPS

010334 012767 ROUT2:  MOV     #-1000,RTNNO
       177000
       170710
010342 005067         CLR     SCOPTR
       170712
010346 012767 PNCH2L: MOV     #PRTY7,PSW      ;SET PRIORITY 7
       000340
       167422
010354 052777         BIS     #BIT6,@PPS
       000100
       170626
010362 032777         BIT     #BIT6,@PPS
       000100
       170620
010370 001020         BNE     RT2B            ;BRANCH IF BIT SET
010372 022767 RT2E:   CMP     #0,SCOPTR
       000000
       170660
010400 001362         BNE     PNCH2L
010402 104000         TYPE
010404 016243         ERRMSG
010406 104000         TYPE
010410 013023         PER2                    ;BIT 6 DIDN'T SET
010412 104000         TYPE
010414 015754         SCOPIN
010416 104000         TYPE
010420 014335         CRLF
010422 005267         INC     SCOPTR
       170632
010426 000167         JMP     PNCH2L
       177714
010432 042777 RT2B:   BIC     #BIT6,@PPS      ;CLEAR ID BIT IN PPS
       000100
       170550
010440 032777         BIT     #BIT6,@PPS
       000100
       170542
010446 001013         BNE     RT2E2           ;BRANCH IF BIT IS SET
010450 022767         CMP     #0,SCOPTR
       000000
       170602
010456 001402         BEQ     GOP2
010460 104001         SCOPE
010462 010346         PNCH2L
010464 005267 GOP2:   INC     RTNNO
       170562
010470 001262         BNE     PNCH1L
010472 000167         JMP     EXIT
       177450
010476 022767 RT2E2:  CMP     #0,SCOPTR
       000000
       170554
010504 001320         BNE     PNCH2L
010506 104000         TYPE
010510 016243         ERRMSG
```

```
010512 104000          TYPE
010514 013056          PER2A                    ;BIT DIDN'T CLEAR
010516 104000          TYPE
010520 015754          SCOPIN
010522 104000          TYPE
010524 014335          CRLF
010526 005267          INC     SCOPTR
       170526
010532 000705          BR      PNCH2L

                ;TEST ABILITY TO CLEAR ID BIT IN PPS (BIT 6) WITH RESET

010534 012767 ROUT3:   MOV     #-1000,RTNNO
       177000
       170510
010542 005067          CLR     SCOPTR
       170512
010546 012767 PNCH3L:  MOV     #PRTY7,PSW
       000340
       167222
010554 052777          BIS     #BIT6,@PPS       ;SET ID BIT IN PPS
       000100
       170426
010562 104011          SRESET
010564 032777          BIT     #BIT6,@PPS
       000100
       170416
010572 001013          BNE     RT3E
010574 022767          CMP     #0,SCOPTR
       000000
       170456
010602 001402          BEQ     GOP3
010604 104001          SCOPE
010606 010546          PNCH3L
010610 005267 GOP3:    INC     RTNNO
       170436
010614 001354          BNE     PNCH3L
010616 000167          JMP     EXIT
       177324
010622 022767 RT3E:    CMP     #0,SCOPTR
       000000
       170430
010630 001346          BNE     PNCH3L
010632 104000          TYPE
010634 016243          ERRMSG
010636 104000          TYPE
010640 013113          PER3                     ;RESET INSTRUCTION FAILD
010642 104000          TYPE                     ;CLEAR ID BIT IN PPS
010644 015754          SCOPIN
010646 104000          TYPE
010650 014335          CRLF
010652 005267          INC     SCOPTR
       170402
010656 000733          BR      PNCH3L
```

```
                ;TEST THAT READY BIT (BIT 7) IS SET FOLLOWING A RESET IO

010660 012767 ROUT4:  MOV     #-1000,RTNNO
       177000
       170364
010666 005067         CLR     SCOPTR
       170366
010672 105777 PNCH4L: TSTB    @PPS
       170312
010676 100013         BPL     RT4E
010700 022767         CMP     #0,SCOPTR
       000000
       170352
010706 001402         BEQ     GOP4
010710 104001         SCOPE
010712 010672         PNCH4L
010714 005267 GOP4:   INC     RTNNO
       170332
010720 001364         BNE     PNCH4L
010722 000167         JMP     EXIT
       177220
010726 022767 RT4E:   CMP     #0,SCOPTR
       000000
       170324
010734 001356         BNE     PNCH4L
010736 104000         TYPE
010740 016243         ERRMSG
010742 104000         TYPE
010744 013175         PER4
010746 104000         TYPE
010750 015754         SCOPIN
010752 104000         TYPE
010754 014335         CRLF
010756 005267         INC     SCOPTR
       170276
010762 000743         BR      PNCH4L
```

```
                ;TEST THAT READY BIT (BIT 7) OF PPS IS RESET BY LOADING
                ;BUFFER

010764 012767 ROUT5:  MOV     #-100,RTNNO
       177700
       170260
010772 005067         CLR     SCOPTR
       170262
010776 104011 PNCH5L: SRESET
011000 004767         JSR     %7,CPRDY        ;CHECK FOR A READY PUNCH
       001440
011004 112777         MOVB    #0,@PPB
       000000
       170200
011012 105777         TSTB    @PPS
       170172
011016 100413         BMI     RT5E            ;BRANCH IF READY BIT NO
011020 022767         CMP     #0,SCOPTR
       000000
       170232
011026 001402         BEQ     GOP5
011030 104001         SCOPE
011032 010776         PNCH5L
011034 005267 GOP5:   INC     RTNNO
       170212
011040 001356         BNE     PNCH5L
011042 000167         JMP     EXIT
       177100
011046 022767 RT5E:   CMP     #0,SCOPTR
       000000
       170204
011054 001350         BNE     PNCH5L
011056 104000         TYPE
011060 016243         ERRMSG
011062 104000         TYPE
011064 013256         PER5
011066 104000         TYPE
011070 015754         SCOPIN
011072 104000         TYPE
011074 014335         CRLF
011076 005267         INC     SCOPTR
       170156
011102 000735         BR      PNCH5L
```

```
                        ;TEST ABILITY TO REFERENCE PUNCH BUFFER

011104 012767 ROUT6:  MOV     #-100,RTNNO
       177700
       170140
011112 005067         CLR     SCOPTR
       170142
011116 012767 PNCH6L: MOV     #CTIE,MACHER      ;SET UP MACHINE ERROR TR
       011156
       166660
011124 005777         TST     @PPB              ;REFERENCE PUNCH BUFFER
       170062
011130 022767         CMP     #0,SCOPTR

       000000
       170122
011136 001402         BEQ     GOP6
011140 104001         SCOPE
011142 011116         PNCH6L
011144 005267 GOP6:   INC     RTNNO
       170102
011150 001362         BNE     PNCH6L
011152 000167         JMP     EXIT
       176770
011156 022767 CTIE:   CMP     #0,SCOPTR
       000000
       170074
011164 001354         BNE     PNCH6L
011166 104000         TYPE
011170 016243         ERRMSG
011172 104000         TYPE
011174 013341         PER6
011176 104000         TYPE
011200 015754         SCOPIN
011202 104000         TYPE
011204 014335         CRLF
011206 005267         INC     SCOPTR
       170046
011212 000741         BR      PNCH6L
```

```
                ;TEST THAT PUNCH IS ABLE TO INTERRUPT IF INTERRUPT IS S
011214 012767 ROUT7:  MOV     #-100,RTNNO
       177700
       170030
011222 005067         CLR     SCOPTR
       170032
011226 104000         TYPE
011230 014126         MESP2
011232 104000         TYPE
011234 014335         CRLF
011236 104007 PNCH7L: STPCHV
011240 011354         CT12C
011242 005067         CLR     PSW
       166530
011246 004767         JSR     %7,CPRDY
       001172
011252 042777         BIC     #BIT6,@PPS
       000100
       167730
011260 052777         BIS     #BIT6,@PPS
       000100
       167722
011266 000240         NOP
011270 022767 RT7E:   CMP     #0,SCOPTR
       000000
       167762
011276 001357         BNE     PNCH7L
011300 104000         TYPE
011302 016243         ERRMSG
011304 104000         TYPE

011306 013410         PER7
011310 104000         TYPE
011312 015754         SCOPIN
011314 104000         TYPE
011316 014335         CRLF
011320 005267         INC     SCOPTR
       167734
011324 000744         BR      PNCH7L
011326 022767 RT7B:   CMP     #0,SCOPTR
       000000
       167724
011334 001402         BEQ     GOP7
011336 104001         SCOPE
011340 011236         PNCH7L
011342 005267 GOP7:   INC     RTNNO
       167704
011346 001333         BNE     PNCH7L
011350 000167         JMP     EXIT
       176572
011354 022626 CT12C:  PIPSP2                  ;POP THE STACK
011356 000763         BR      RT7B            ;CONTINUE TEST
```

```
                        ;TEST THAT PUNCH DOES NOT RE-INTERRUPT AFTER RTI

011362 012767 ROUT8:    MOV     #-100,RTNNO
       177700
       167664
011366 005067           CLR     SCOPTR          ;CLEAR SCOPE FLAG
       167666
011372 104007 PNCH8L:   STPCHV
011374 011510           CT13C                   ;SET PUNCH INTERRUPT VEC
011376 005067           CLR     PSW             ;PRIORITY 0
       166374
011402 004767           JSR     %7,CPRDY        ;CHECK FOR PUNCH READY
       001036
011406 042777           BIC     #BIT6,@PPS      ;DISABLE PUNCH INTERRUPT
       000100
       167574
011414 052777           BIS     #BIT6,@PPS      ;ENABLE PUNCH INTERRUPT
       000100
       167566
011422 000240           NOP
011424 022767 RT8E:     CMP     #0,SCOPTR
       000000
       167626
011432 001357           BNE     PNCH8L
011434 104000           TYPE
011436 016243           ERRMSG
011440 104000           TYPE
011442 013454           PER8
011444 104000           TYPE
011446 015754           SCOPIN
011450 104000           TYPE
011452 014335           CRLF
011454 005267           INC     SCOPTR
       167600
011460 000744           BR      PNCH8L
011462 022767 RT8B:     CMP     #0,SCOPTR
       000000
       167570
011470 001402           BEQ     GOP8
011472 104001           SCOPE
011474 011372           PNCH8L
011476 005267 GOP8:     INC     RTNNO
       167550
011502 001333           BNE     PNCH8L
011504 000167           JMP     EXIT
       176436
011510 012777 CT13C:    MOV     #CT13E2,@PCHVTR
       011530
       167502
011516 012716           MOV     #CT13D,@%6
       011524
011522 000002           RTI
011524 000240 CT13D:    NOP
011526 000755           BR      RT8B
011530 022626 CT13E2:   PIPSP2
011532 022767           CMP     #0,SCOPTR
       000000
```

```
        167520
011540 001314           BNE     PNCH8L
011542 104000           TYPE
011544 016243           ERRMSG
011546 104000           TYPE
011550 013504           PER8A
011552 104000           TYPE
011554 015754           SCOPIN
011556 104000           TYPE
011560 014335           CRLF
011562 005267           INC     SCOPTR
        167472
011566 000735           BR      RT8B

                ;TEST THAT PUNCH DOES NOT INTERRUPT WITH PROCESSOR AT SH
                ;PRIORITY

011570 012767 ROUT9:    MOV     #-100,RTNNO
        177700
        167454
011576 005067           CLR     SCOPTR
        167456
011602 104007 PNCH9L:   STPCHV
011604 011666           CT14E
011606 016767           MOV     PCHLVL,PSW
        167410
        166162
011614 005077           CLR     @PPS
        167370
011620 004767           JSR     %7,CPRDY
        000620
011624 052777           BIS     #BIT6,@PPS
        000100
        167356
011632 000240           NOP
011634 005077           CLR     @PPS
        167350
011640 022767           CMP     #0,SCOPTR
        000000
        167412
011646 001402           BEQ     GOP9
011650 104001           SCOPE
011652 011602           PNCH9L
011654 005267 GOP9:     INC     RTNNO
        167372
011660 001350           BNE     PNCH9L
011662 000167           JMP     EXIT
        176260
011666 022626 CT14E:    PIPSP2
011670 022767           CMP     #0,SCOPTR
        000000
        167362
011676 001341           BNE     PNCH9L
011700 104000           TYPE
011702 016243           ERRMSG
011704 104000           TYPE
011706 013567           PER9
```

```
011710 104000          TYPE
011712 015754          SCOPIN
011714 104000          TYPE
011716 014335          CRLF
011720 005267          INC       SCOPTR
       167334
011724 000726          BR        PNCH9L

                ;TEST THAT PUNCH INTERRUPTS WITH PROCESSOR AT PRIORITY E
                ;LOWER THAN THE PUNCH PRIORITY

011726 012767 ROUT10: MOV        #-100,RTNNO
       177700
       167316
011734 005067          CLR       SCOPTR
       167320
011740 104007          STPCHV
011742 012040          CT15B
011744 016767 PCH10L: MOV        PCHLVL,PSW
       167252
       166024
011752 162767          SUB       #40,PSW
       000040
       166016
011760 042777          BIC       #BIT6,@PPS
       000100
       167222
011766 004767          JSR       %7,CPRDY
       000452
011772 052777          BIS       #BIT6,@PPS
       000100
       167210
012000 000240          NOP
012002 022767 CT15E:  CMP       #0,SCOPTR
       000000
       167250
012010 001355          BNE       PCH10L
012012 104000          TYPE
012014 016243          ERRMSG
012016 104000          TYPE
012020 013630          PER10
012022 104000          TYPE
012024 015754          SCOPIN
012026 104000          TYPE
012030 014335          CRLF
012032 005267          INC       SCOPTR
       167222
012036 000742          BR        PCH10L
012040 022626 CT15B:  PIPSP2
012042 022767          CMP       #0,SCOPTR
       000000
       167210
012050 001402          BEQ       GOP41
012052 104001          SCOPE
012054 011744          PCH10L
012056 005267 GOP41:  INC       RTNNO
       167170
012062 001330          BNE       PCH10L
012064 000167          JMP       EXIT
       176056
```

```
                ;TEST THE PUNCH SPEED ROUTINE

012270 104000 ROUT30: TYPE
012272 014060         PNCHSD                    ;TYPE "PUNCH SPEED TEST"
012274 104000         TYPE
012276 014335         CRLF
012300 005067         CLR     COUNT
       173302
012304 012767         MOV     #-24,COUNT1
       177754
       173276
012312 012777         MOV     #15,@TPB
       000015
       167112
012320 112777         MOVB    #0,@PPB
       000000
       167064
012326 012700         MOV     #PSPD,%0
       013676
012332 105777 PGETIT: TSTB    @PPS              ;SEE IF PUNCH DONE
       167052
012336 100402         BMI     PSETCT
012340 000167         JMP     PTYPIT
       000014
012344 012777 PSETCT: MOV     #0,@PPB           ;PUNCH DONE--POKE IT
       000000
       167040
012352 005267         INC     COUNT             ;ALSO COUNT IT
       173230
012356 000765         BR      PGETIT
012360 105777 PTYPIT: TSTB    @TPS              ;SEE IF PRINTER DONE
       167044
012364 100401         BMI     PTTYP
012366 000761         BR      PGETIT
012370 112077 PTTYP:  MOVB    (0)+,@TPB         ;PRINTER READY--PRINT
       167036
012374 005267         INC     COUNT1
       173210
012400 001354         BNE     PGETIT
012402 004767         JSR     %7,CONVT
       173046
012406 104000         TYPE
012410 016251         CPS
012412 000167         JMP     EXIT
       175730
012416 104000 ROUT31: TYPE
012420 014101         PBCNT
012422 005067         CLR     CNT
       173602
012426 012767         MOV     #-4000,CNT2
       174000
       000206
012434 004767 GOP31:  JSR     %7,RNGEN
       167676
012440 042700         BIC     #177700,%0
       177700
012444 022700         CMP     #0,%0
```

```
        000000
012250  001771          BEQ     GOP31
012252  012067          MOV     %0,BLKLEN
        173544
012256  004767  GOP33:  JSR     %7,RNGEN
        167654
012262  042700          BIC     #177700,%0
        177700
012266  022700          CMP     #0,%0
        000000
012272  001771          BEQ     GOP33
012274  010067          MOV     %0,STALL1
        173516
012300  016777  GOP22:  MOV     CNT,@PPB
        173524
        166704
012306  105777          TSTB    @PPS
        166676
012312  100375          BPL     .-4
012314  005267          INC     CNT
        173510
012320  005267          INC     CNT2
        000116
012324  022767          CMP     #0,CNT2
        000000
        000110
012332  001416          BEQ     PDONE
012334  005367          DEC     BLKLEN
        173462
012340  001357          BNE     GOP22
012342  005367  PSTLLA: DEC     STALL1
        173450
012346  001732          BEQ     GOP31
012350  012767          MOV     #-200,STALL2
        177600
        173442
012356  005267  SPLOOP: INC     STALL2
        173436
012362  001375          BNE     SPLOOP
012364  000167          JMP     PSTLLA
        177752
012370  104000  PDONE:  TYPE
012372  013723          PTST1
012374  104000          TYPE
012376  014002          PTST2
012400  104000          TYPE
012402  014025          PTST3
012404  105777  TLOOPP: TSTB    @TKS
        166614
012410  100401          BMI     TSTKEY
012412  000774          BR      TLOOPP
012414  117767  TSTKEY: MOVB    @TKB,KEYX
        166606
        000016
012422  122767          CMPB    #220,KEYX
        000220
        000010
```

```
012430 001401          BEQ     PEXIT
012432 000764          BR      TLOOPP
012434 000167 PEXIT:   JMP     NNN
       000030
012440 000000 KEYX:    0
012442 000000 CNT2:    0

012444 005777 CPRDY:   TST     @PPS
       166540
012450 100424          BMI     CPRDYA
012452 105777          TSTB    @PPS
       166532
012456 100001          BPL     CPRDYA
012460 000207        RTS     %7
012462 104000 CPRDYA:  TYPE
012464 014165          PNRDY
012466 000766          BR      CPRDY
012470 004767 NNN:     JSR     %7,AREAD
       167362
012474 105777          TSTB    @PRB
       166506
012500 001373          BNE     NNN
012502 012767          MOV     #-2000,CNT2
       176000
       177732
012510 005067          CLR     CNT
       173314
012514 004767 VERPT:   JSR     %7,AREAD
       167336
012520 017767          MOV     @PRB,HSR
       166462
       173266
012526 005267          INC     CNT2
       177710
012532 001433          BEQ     PTEND
012534 005267          INC     CNT
       173270
012540 042767          BIC     #177400,CNT
       177400
       173262
012546 026767          CMP     CNT,HSR
       173256
       173240
012554 001757          BEQ     VERPT
012556 104000 ERXQN:   TYPE
012560 016223          TGOOD
012562 016701          MOV     CNT,%1
       173242
012566 004767          JSR     %7,BINI
       173152
012572 104000          TYPE
012574 014335          CRLF
012576 104000          TYPE
012600 016204          TBAD
012602 016701          MOV     HSR,%1
       173206
012606 004767          JSR     %7,BINI
```

```
        173132
012612  104000          TYPE
012614  014335          CRLF
012616  000167          JMP NNN
        177646
012622  104000  PTEND:  TYPE
012624  012640          PTXEND
012626  104000          TYPE
012630  014335          CRLF
012632  000000          HALT
012634  000167          JMP     STARTP
        175240
```

SECTION VI

PARTS LISTS

6-1. GENERAL.

This section contains the engineering parts lists applicable to the operation and maintenance of the R-9001-11 Tape Reader/Punch Controller.

6-2. PARTS LISTS INDEX.

Number	Title
127062-01	Controller RP
127469-01	Controller RO
127278-01	Reader Cable
127279-01	Punch Cable
127492-01	Interface Kit, Reader Only
127493-01	Interface Kit, Reader/Punch

LINE NO.	PART NO.	DESCRIPTION	QTY REQ'D PER ASSY 1	2	3	4	5	6	7	UNIT QTY	REF DWG.	REMARKS	TYPE *	REV SYM
1	127062-01	PCB ASSY, PDP-11 INTFC	1											
2	127063-01	PCB, PDP-11 INTFC	1											
3	127064	ARTWORK, PCB, PDP-11 INTFC		1										
4	127125	ARTWORK, SILKSCREEN		1										
5	11120	PROCESS SPECIFICATION		1										
6														
7	304061-21	CAPACITOR, 470pf, ±10%, 200V	6								C1,6,7,8,9,10			
8	304061-41	CAPACITOR, .022μf, ±10%, 50V	1								C5			
9														
10	304055-08	CAPACITOR, .01μf, ±20%, 100V	23								C1-3,11,14,15,17-21,23-26			
11	304951-01	CAPACITOR, 22μf, ±20%, 15V	9								C4,7-10			
12	304951-05	CAPACITOR, 4.7μf, ±10%, 10V	1								C13			
13	304951-29	CAPACITOR, 6.8μf, ±10%, 35V	1								C12			
14														
15														
16	335005-25	RESISTOR, 100Ω, ±5%, 1/4W	10								R26,29,30,33,38,39,50,53,61,63			
17	335005-31	RESISTOR, 180Ω, ±5%, 1/4W	4								R60,62,68,69			
18														
19	335005-33	RESISTOR, 220Ω, ±5%, 1/4W	1								R36			
20	335005-39	RESISTOR, 390Ω ±5%, 1/4W	2								R67,68			
21	335005-42	RESISTOR, 510Ω, ±5%, 1/4W	1								R12			
22	335005-49	RESISTOR, 1K, ±5%, 1/4W	19								R1,2,7,29,31,32,34,35,37,40,41,47,48,51-53,55,57,71,72			
23	335005-53	RESISTOR, 1.5K, ±5%, 1/4W	2								R42,70			
24	335005-65	RESISTOR, 4.7K, ±5%, 1/4W	11								RP-11			
25	335005-77	RESISTOR, 5K, ±5%, 1/4W	2								R43,45			
26	335005-81	RESISTOR, 33K, ±5%, 1/4W									R46			

* REVISION CODE
ADD — ADDITION
DEL — DELETION
SUB — SUBSTITUTION
INFO — ADDITIONAL INFORMATION
QY — QUANTITY CHANGED

REV	E.O. #	DATE	ISSUED BY
A	[illegible]	4/4/75	[illegible]
B	5655	11/14/75	[illegible]

APPROVED DATE
DR [illegible] 11/14/75
CHK [illegible]
APPD D. Jung 11/14/75
APPD [illegible]

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA

TITLE PARTS LIST-
PCB ASSY [illegible]

SIZE B | CODE IDENT NO 97525 | DWG NO [illegible]-01

SHEET 1 OF 2

F258

ORIG [illegible]

LINE NO.	PART NO.	DESCRIPTION	QTY REQ'D PER ASSY 1	2	3	4	5	6	7	UNIT QTY	REF NO.	REMARKS	TYPE *	REV SYM
27	335005-89	RESISTOR, 47K, ±5%, 1/4W	3								R44,49,55			
28	346502-01	JUMPER	1/2											
29														
30	326003-01	I.C. 2-INPUT POSITIVE NAND GATE	11								IC3,5,7,21,22,32,34,37,39,41,42	SN7400N		
31	326003-07	I.C. 2-INPUT POSITIVE NOR GATE	6								IC10,17,31,38,47,54	SN7402N		
32	326010-04	I.C. 2-INPUT EXCLUSIVE OR GATES	6								IC15,16,24,26,36,46	SN7486N		
33	326010-07	I.C. QUAD 2-INPUT OR GATE	1								IC59	SP384A		
34	326010-08	I.C. QUAD 2-INPUT NOR GATE	8								IC30,40,50,51,60-63	SP380A		
35	326020-02	I.C. 2-INPUT POSITIVE NAND BUFFER	9								IC20,27,28,45,49,54,55,57,58	SN7438N		
36	326202-01	I.C. HEX INVERTER	3								IC1,43,44	SN7404N		
37	326402-05	I.C. 4 BIT LATCHES	4								IC52,56,62,64	SN7475N		
38	326402-09	I.C. FLIP FLOP	5								IC11,12,13,48,53	SN7474N		
39	326651-04	I.C. MONOSTABLE MULTIVIBRATOR	3								IC6,13,33	U9A960259X		
40	326712-04	I.C. QUAD EXCLUSIVE NOR GATES	3								IC9,19,29	N8242A		
41														
42	303906-01	HANDLE, CARD	2											
43	311061-10	CONNECTOR, 34 PIN, RT ANGLE	2								JA,JB			
44	322917-06	RIVET, POP	4											
45														
46														
47	322110-05	SCREW, FILLISTER HD, 2-56 3/8 LG	8											
48	1100660-01	WASHER, SPLIT, LOCK, #2	8											
49	1100664-01	NUT, HEX, 2-56	8											
50	122549-01	SPRING CLIP, CONN. RETAINER	4											
51														
52														
53	339327-05	SWITCH, 8 POSITIONS	1											
54	339327-12	COVER, SWITCH	1											

CODE IDENT NO 97525 | DWG NO 127062-01

SHEET 2 OF 2

LINE NO.	PART NO.	DESCRIPTION	QTY REQ'D PER ASSY 1	2	3	4	5	6	7	UNIT QTY	REF NO.	REMARKS	TYPE *	REV SYM
1	127469-01	PCB ASSY, PDP-11 INTFC	1											
2	127063-01	PCB, PDP-11 INTFC		1										
3	127064	ARTWORK, PCB, PDP-11 INTFC			1/2									
4	127471	ARTWORK, SILKSCREEN			1/2									
5	111201	PROCESS SPECIFICATION			1/2									
6														
7	304061-21	CAPACITOR, 470pf, ±10%, 200V		4							C1,8 14,16			
8	304061-41	CAPACITOR, .022μf, ±10%, 50V		1							C9			
9														
10	304055-02	CAPACITOR, .01μf, ±20%, 100V		29							C2,3,11,33-38 73-82			
11	304951-01	CAPACITOR, 22μf, ±20%, 15V		9							C17-25			
12	304951-05	CAPACITOR, 4.7μf, ±10%, 10V		1							C13			
13	304951-29	CAPACITOR, 6.8μf, ±10%, 35V		1							C.7			
14														
15														
16	335005-25	RESISTOR, 100Ω, ±5%, 1/4W		6							R26,29,30, 33,50,63			
17	335005-31	RESISTOR, 180Ω, ±5%, 1/4W		2							R 62, 69,			
18														
19														
20	335005-39	RESISTOR, 390Ω, ±5%, 1/4W		1							R57			
21	335005-42	RESISTOR, 510Ω, ±5%, 1/4W		1							R12			
22	335005-49	RESISTOR, 1K, ±5%, 1/4W		9							R25,27,28,31,32, 48,51,59,71			
23	335005-53	RESISTOR, 1.5K, ±5%, 1/4W		1							R70			
24	335005-65	RESISTOR, 4.7K, ±5%, 1/4W		11							R1-11			
25	335005-77	RESISTOR, 15K, ±5%, 1/4W		1							R45			
26	335005-81	RESISTOR, 33K, ±5%, 1/4W		1							R46			
27	335005-89	RESISTOR, 47K, ±5%, 1/4W		2							R44,55			
28	346502-01	JUMPER		1/2										
29														
30	326003-01	I.C. 2-INPUT POSITIVE NAND GATE		8							IC3,5,21,22 34,37,39,41,	SN7400N		
31	326003-07	I.C. 2-INPUT POSITIVE NOR GATE		4							IC10,31, 38,47	SN7402N		
32	326010-04	I.C. 2-INPUT EXCLUSIVE OR GATES		4							IC15,16,24, 26,	SN7486N		
33	326010-07	I.C. QUAD 2-INPUT OR GATE		1							IC59	SP384A		
34	326010-08	I.C. QUAD 2-INPUT NOR GATE		8							IC30,40,50,51, 60-63	SP380A		
35	326020-02	I.C. 2-INPUT POSITIVE NAND BUFFER		7							IC20,28,45 49,55,57,58	SN7438N		
36	326202-01	I.C. HEX INVERTER		2							IC14, 44	SN7404N		
37	326402-05	I.C. 4 BIT LATCHES		2							IC2,35	SN7475N		
38	326402-09	I.C. FLIP FLOP		3							IC11,18 48	SN7474N		
39	326651-04	I.C. MONOSTABLE MULTIVIBRATOR		2							IC6,13	U9A960259X		
40	326802-04	I.C. QUAD EXCLUSIVE NOR GATES		3							IC9,19, 29	N8242A		
41														
42	303906-01	HANDLE, CARD		2										
43	311061-10	CONNECTOR, 34 PIN, RT ANGLE		1							J4			
44	322917-06	RIVET, POP		4										
45														
46														
47	322110-05	SCREW, FILLISTER HD, 2-56 3/8 LG		4										
48	110660-01	WASHER, SPLIT, LOCK, #2		4										
49	110664-01	NUT, HEX, 2-56		4										
50	122549-01	SPRING CLIP, CONN. RETAINER		2										
51														
52														
53	339327-05	SWITCH, 8 POSITIONS		1										
54	339327-12	COVER, SWITCH		1										

CODE IDENT NO 97525 | DWG NO. 127469-01 | SHEET 2 OF 2

* REVISION CODE
ADD — ADDITION
DEL — DELETION
SUB — SUBSTITUTION
INFO — ADDITIONAL INFORMATION
QY — QUANTITY CHANGED

REV	E.O. #	DATE	ISSUED BY
A	REL	4/10/75	
B	5655	10/14/75	

APPROVED DR K. Watson 4-4-75
CHK [illegible] 4-3-75
APPD B. Fiume 4-4-75
APPD [illegible] 4/4/75

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA
TITLE PARTS LIST - PCB ASSY, PDP-11 INTFC (READER ONLY)
SIZE B | CODE IDENT NO 97525 | DWG NO. 127469-01
SHEET 1 OF 2

F258

ORIGINAL

LINE NO.	PART NO.	DESCRIPTION	QTY REQ'D PER ASSY 1 2 3 4 5 6 7	UNIT QTY	REF NO.	REMARKS	TYPE *	REV SYM
1	127278-01	CABLE ASSY, READER INTERFACE	1					
2								
3	311061-09	CONN, 34 PIN	1		P2			
4	346419-05	CABLE, FLAT 34 COND 28 AWG	AR					
5	311178-05	CONNECTOR, 25 PIN	1		P1			
6	311005-08	SHELL, CONN	1					
7	311006-03	END DISC	2					
8	346003-06	WIRE, BUSS 26 AWG SOLID	AR					
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

* REVISION CODE
ADD — ADDITION
DEL — DELETION
SUB — SUBSTITUTION
INFO — ADDITIONAL INFORMATION
QY — QUANTITY CHANGED

REV	E.O. *	DATE	ISSUED BY
A	REL	5/2/75	
B	5655 Ry	10/14/75	

APPROVED	DATE
DR M. WANISH	
CHK C KUTASCHEWSKY	2-27-75
APPD D. Fung	4/4/75
APPD	4/4/75

SHEET 1 OF 1

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA

TITLE PARTS LIST-
CABLE ASSY, READER INTERFACE

SIZE	CODE IDENT NO.	DWG NO.
B	97525	127278-01

EEco Master Dwg. # 117204

LINE NO.	PART NO.	DESCRIPTION	QTY REQ'D PER ASSY 1 2 3 4 5 6 7	UNIT QTY	REF NO.	REMARKS	TYPE *	REV SYM
1	127279-01	CABLE ASSY, PUNCH INTERFACE	1					
2								
3	311061-09	CONN, 34 PIN	1		P2			
4	346419-05	CABLE, FLAT 34 COND 28 AWG	AR					
5	311178-05	CONN., 25 PIN	1		P1			
6	311005-08	SHELL CONN	1					
7	311006-03	END DISC	2					
8	346003-06	WIRE, BUSS 26 AWG SOLID	AR					
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

* REVISION CODE
ADD — ADDITION
DEL — DELETION
SUB — SUBSTITUTION
INFO — ADDITIONAL INFORMATION
QY — QUANTITY CHANGED

REV	E.O. *	DATE	ISSUED BY
A	REL	5/2/75	
B	5655 Ry	10/14/75	

APPROVED	DATE
DR M.WANISH	
CHK C KUTASCHEWSKY	2-27-75
APPD D. Fung	4/4/75
APPD	4/4/75

SHEET 1 OF 1

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA

TITLE PARTS LIST-
CABLE ASSY, PUNCH INTERFACE

SIZE	CODE IDENT NO.	DWG NO.
B	97525	127279-01

EEco Master Dwg. # 117204

LINE NO.	PART NO.	DESCRIPTION	QTY PER ASSY 1 2 3 4 5 6 7	UNIT QTY	REF NO.	REMARKS	TYPE *	REV SYM
1	230933-01	SPECIFICATION, TAPE RDR INTFC	R E F					
2								
3								
4								
5								
6	127492-01	KIT, READER INTERFACE, 230933	1					
7								
8	127278-01	CABLE ASSY, READER INTERFACE	1			SEE SEPARATE PARTS LIST		
9	127469-01	PCB ASSY, PDP-11 INTFC	1			SEE SEPARATE PARTS LIST		
10	127284-01	TAPE, DIAGNOSTIC	1			TO BE SHIPPED WITH KIT, (1) COPY		
11	011138	MANUAL, 230933 INTERFACE	1			TO BE SHIPPED WITH KIT, (1) COPY		
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

* REVISION CODE
ADD – ADDITION
DEL – DELETION
SUB – SUBSTITUTION
INFO – ADDITIONAL INFORMATION
QY – QUANTITY CHANGED

REV	E.O. *	DATE	ISSUED BY
A	REL	4/18/75	
B	5655 R1	10/14/75	

APPROVED DATE
DR J. Hall 4/75
CHK Carl Walters 4/17/75
APPD 9/14/75
APPD 9/17/75
SHEET 1 OF 1

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA
TITLE PARTS LIST-
KIT, RDR. INTERFACE
230933
SIZE B | CODE IDENT NO 97525 | DWG NO. 127492-01

LINE NO.	PART NO.	DESCRIPTION	QTY PER ASSY 1 2 3 4 5 6 7	UNIT QTY	REF NO.	REMARKS	TYPE *	REV SYM
1	230934	SPECIFICATION, RDR/PUNCH INTERFACE KIT	R E F			TO BE SHIPPED WITH KIT		
2	127283	PROCEDURE, DIAGNOSTIC	R E F			TO BE SHIPPED WITH KIT		
3	127284-01	TAPE, DIAGNOSTIC	R E F			TO BE SHIPPED WITH KIT		
4	127062	SCHEMATIC, PCB ASSY, PDP-11 INTFC	R E F			TO BE SHIPPED WITH KIT		
5								
6	127493-01	KIT, RDR/PUNCH INTERFACE, 230934	1					
7								
8	127278-01	CABLE ASSY, READER INTERFACE	1			SEE SEPARATE PARTS LIST		
9	127279-01	CABLE, ASSY, PUNCH INTERFACE	1			SEE SEPARATE PARTS LIST		
10	127062-01	PCB ASSY, PDP-11 INTFC	1			SEE SEPARATE PARTS LIST		
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

* REVISION CODE
ADD – ADDITION
DEL – DELETION
SUB – SUBSTITUTION
INFO – ADDITIONAL INFORMATION
QY – QUANTITY CHANGED

REV	E.O. *	DATE	ISSUED BY
A	REL	9/17/75	

APPROVED DATE
DR 9/16/75
CHK 9/17/75
APPD 9/14/75
APPD 9/17/75
SHEET 1 OF 1

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA
TITLE PARTS LIST-
KIT, RDR/PUNCH INTERFACE
230934
SIZE B | CODE IDENT NO 97525 | DWG NO. 127493-01 | REV A

F258

SECTION VII
DRAWINGS

7-1. GENERAL.

This section contains the engineering drawings applicable to the operation and maintenance of the R-9001-11 Tape Reader/Punch Controller.

7-2. DRAWING INDEX.

Number	Title
127062	Controller, RP Assembly and Schematic Diagram
127469	Controller, RO Assembly and Schematic Diagram
127278-01	Reader Interface Cabling Diagram
127279-01	Punch Interface Cabling Diagram

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASED	4/4/75	
	B	E05655 RY	9/9/75	

NOTES: UNLESS OTHERWISE SPECIFIED.

1. PCB SHOULD HAVE SILK-SCREEN ARTWORK P/N 127125 NEARSIDE AND FARSIDE PRIOR TO INSTALLING & SOLDERING OF COMPONETS.
2. NOTCH OR DOT ON IC INDICATES PIN NO. 1 LOCATION TYP.

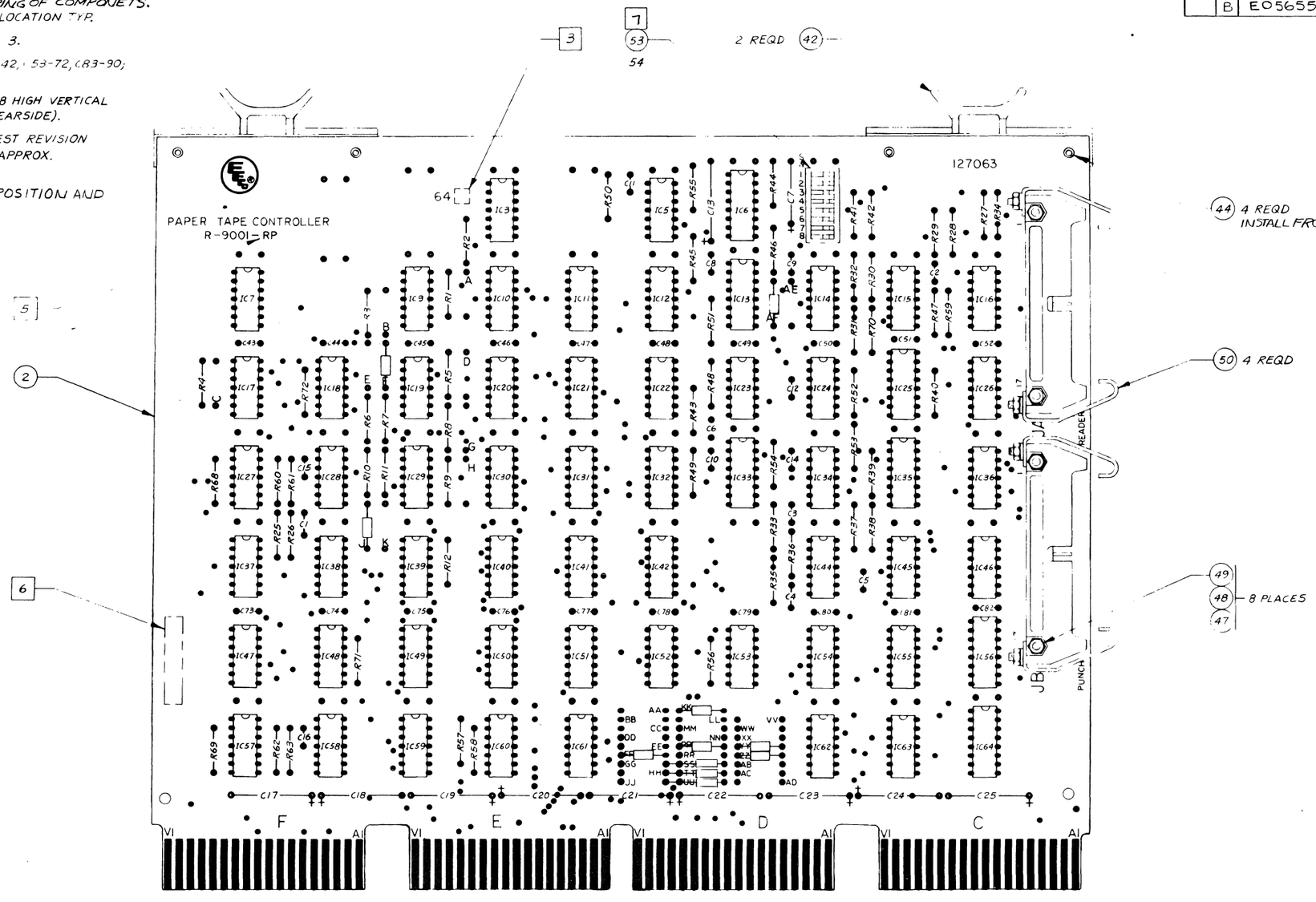
[3] FOR LATEST REVISION SEE ARTWORK, ITEM 3.

4. REFEREN : DESIGNATORS IC1, 2, 4, 8, 43, C26-42, 53-72, C83-90, R13-24, R64-67 ARE NOT USED.

[5] RUBBER STAMP CHARACTERS SHOWN WITH 1/8 HIGH VERTICAL BLACK CHARACTERS APPROX. WHERE SHOW (NEARSIDE).

[6] RUBBER STAMP PART NO. 127062-01 AND LATEST REVISION WITH 1/8 HIGH VERTICAL BLACK CHARACTERS APPROX. WHERE SHOWN (NEARSIDE).

[7] SET SWITCHES 1,2,3,5,6,7 TO THE "OFF" POSITION AND 4,8 TO THE "ON" POSITION.



SEE SEPARATE LIST OF MAT'L PL-127062-01

QTY REQD	ITEM NO	REF DES	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE	CODE IDENT

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES. TOLERANCES ON DECIMALS .XX ± .XXX ± ANGLE ± 1/2°

DO NOT SCALE DRAWING

BREAK SHARP EDGES

MATERIAL

FINISH

CONTRACT NO.

	APPROVED	DATE
DRAWN	[illegible]	8/6/75
CHECK	[illegible]	9/9/75
ENGR	D. Fung	8/4/75
MGR	[illegible]	9/9/75

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA

TITLE: PCB ASSY, PDP-11 INTFC

SIZE	CODE IDENT NO.	DWG NO.
D	97525	127062

SCALE: NONE SHEET 1 OF 4

"THE INFORMATION CONTAINED HEREON IS PROPRIETARY AND CONFIDENTIAL TO ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA AND SHALL NOT BE USED OR DISCLOSED, IN WHOLE OR IN PART, WITHOUT FIRST OBTAINING THE WRITTEN PERMISSION OF ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA."

127062

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1 FOR REV		

(CONTINUED FROM SHT 1)

NOTES: UNLESS OTHERWISE SPECIFIED

7. RESISTOR VALUES ARE IN OHM, ±5%, 1/4 WATT.
8. CAPACITOR VALUES ARE MICROFARADS, ±20%, 100V.
9. THE FOLLOWING DESIGNATIONS HAVE BEEN OMITTED IC 1,2,4,8, 43. C 26 THRU 42, 53 THRU 72, 83 THRU 90. R13 THRU 24, 64 THRU 67.

SPARE GATES		
IC. NO.	INPUTS	OUTPUTS
IC 5	1,2	3
IC 30	6,7	2
IC 32	1,2	3
IC 32	4,5	6
IC 38	2,3	1
IC 38	5,6	4
IC 40	4,5	3
IC 52	4,5	6
IC 54	11,12	13
IC 58	9,10	8

(SHT 4) PUN MASTER
(SHT 3) RDR MASTER
IC39 7400
IC49 7438
DØ5L < FF1
DØ4L < FN2
DØ3L < FL1
INTRL < FM1
IC58 7438
DØ2L < FE2
IC38 7402
RDR INT DONE (SHT 3)
PUN INT DONE (SHT 4)
FC1 SSYNL IC59 384
FD1 BBSYL IC59 384
IC39 7400
MASTER ACK (SHT 3,4)

CA2
DA2
EA2
FA2
C43 THRU C52 .01
C73 THRU C82 .01
+5V
C17 THRU C25 22, 15V
GND
CC2,T1
DC2,T1
EC2,T1
FC2.T1

EE1 MSYNL
ED1 AI7L
EE2 AI6L
ED2 AI5L
EK1 AI4L
EK2 AI3L
EC1 AI2L
EL1 AI1L
EP1 AI0L
ER1 A9L
EN2 A8L
EP2 A7L
EU1 A6L
EV1 A5L
EU2 A4L
EV2 A3L
IC30 380
IC40 380
IC50 380
IC60 380
IC9 8242
IC19 8242
IC29 8242
R1 4.7K
R2 4.7K
R3 4.7K
R4 4.7K
R5 4.7K
R6 4.7K
R7 4.7K
R8 4.7K
R9 4.7K
R10 4.1K
R11 4.7K
A B C D E F G H J K
+5V
R12 510

+5V
R25 1K
R26 100
C1 470PF 10% 200V
IC28 7438
SSYN L < EJI
DEVICE ENABLE
IC39 7400

EF1 AØ2L
EH1 AØ1L
IC51 380
IC41 7400
IC31 7402
PRS (SHT 3)
PRB (SHT 3)
PPS (SHT 4)
PPB (SHT 4)

EH2 AØØL
EJ2 CØØL
IC61 380
DATAIS (SHT 3,4)
EF2 CØ1L
DATAOS (SHT 3,4)
DL1 INITL
INIT (SHT 3,4)
INIT (SHT 3,4)

CS2 DØØL IC62 BITØØ (SHT 3,4)
CR2 DØ1L IC62 BITØ1 (SHT 3,4)
CU2 DØ2L IC62 BITØ2 (SHT 4)
CT2 DØ3L IC62 BITØ3 (SHT 4)
CN2 DØ4L IC63 BITØ4 (SHT 4)
CP2 DØ5L IC63 BITØ5 (SHT 4)
CV2 DØ6L IC63 BITØ6 (SHT 3,4)
CM2 DØ7L IC63 BITØ7 (SHT 4)

SIZE	CODE IDENT NO.	DWG NO.
D	97525	127062
SCALE NONE		SHEET 2 OF 4

REVISIONS			
ZONE LTR	DESCRIPTION	DATE	APPROVED

SEE SH 1 FOR REV.

RDR INT EN
RDR INT RQ
RDR FLAG
RDR RUN
RFC
DATA STROBE
RDR INT DONE
RDR BG OUT
JUMPER
JUMPER
JUMPER
DRIVE LEFT
DRIVE RIGHT
SPK
PUN BG OUT
MASTER ACK
BRL
SACK L
BBSYL
RDR MASTER
DATAOS
PRS
INIT
RFC
PRB
RCLK
BITØ0
BITØ1
BITØ6
DATAIS
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
DØ0L CS2
DØ1L CR2
DØ2L CU2
DØ3L CT2
DØ4L CN2
DØ5L CP2
DØ6L CV2
DØ7L CM2
DØ6L
DØ7L
DI1L
DI5L
DK2
DM2
DP2
DS2
DH2
DF2
DE2
DD2
DL2
DN2
DR2
DT2
FT2
FDI
CV2
CM2
CH1
CD2
+R
+5V
JA
S6
S7
SB
IC3 7400
IC5 7400
IC10 7402
IC11 7474
IC12 7474
IC13 9602
IC14 7404
IC15 7486
IC20 7438
IC21 7400
IC22 7400
IC24 7486
IC26 7486
IC34 7400
IC35 7475
IC37 7400
IC44 7404
IC45 7438
IC47 7402
IC48 7474
IC55 7438
IC57 7438
IC58 7438
IC59 384
IC6 9602
C7 6.8 10%, 35V
C8 .470PF, 10%, 200V
C9 .022, 10%, 50V
C10 .01
C11 .01
C12 .470PF, 10%, 200V
C13 4.7, 10%, 10V
C16 470PF, 10%, 200V
C2 .01
C3 .01
R27 1K
R28 1K
R29 100
R30 100
R31 1K
R32 1K
R33 100
R44 47K
R45 15K
R46 33K
R50 100
R51 1K
R55 47K
R57 390
R59 1K
R62 180
R63 100
R69 180
R70 1.5K
R71 1K

SIZE	CODE IDENT NO.	DWG NO.
D	97525	127062
SCALE NONE		SHEET 3 OF 4

127062

REVISIONS			
ZONE LTR	DESCRIPTION	DATE	APPROVED

SEE SH 1 FOR REV.

(SHT 2) PPS
(SHT2,3) DATAIS
BIT06
(SHT 2,3) INIT
PUN DONE
(SHT 2,3) INIT
(SHT 2,4) DATAOS
PUN INT EN
TAPE ERROR
PUN FLAG
PPB
DØ7L
DØ6L
PUN INT EN
DI5L
PUN INT Q
BR L
SACK L
BBSY L
PUN MASTER
(SHT 2)
PUN INT DONE
(SHT 2)
PUN START
DIRECTION
MASTER ACK
PUN BG OUT
(SHT 3)
RDR BG OUT
DH2
DF2
DE2
DD2
DT2
DR2
DN2
DL2
(SHT 2) PPB
BPPB
(SHT 2,3) BITØØ
(SHT 2,3) BITØ1
(SHT 2) BITØ2
(SHT 2) BITØ3
(SHT 2) BITØ4
(SHT 2) BITØ5
(SHT 2,3) BITØ6
(SHT 2) BITØ7
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
TERROR
PUN READY
TAPE ERROR
PUN DONI
JB

SIZE D	CODE IDENT NO. 97525	DWG NO. 127062	
SCALE NONE			SHEET 4 OF 4

127062

40-108

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASE	4/10/75	
	B	E05655 RY	11/14/75	

NOTES: UNLESS OTHERWISE SPECIFIED.

1. PCB SHOULD HAVE SILK-SCREEN ARTWORK P/N 127471 NEAR SIDE PRIOR TO INSTALLING & SOLDERING OF COMPONETS
2. NOTCH OR DOT ON IC INDICATES PIN NO. 1 LOCATION TYP.

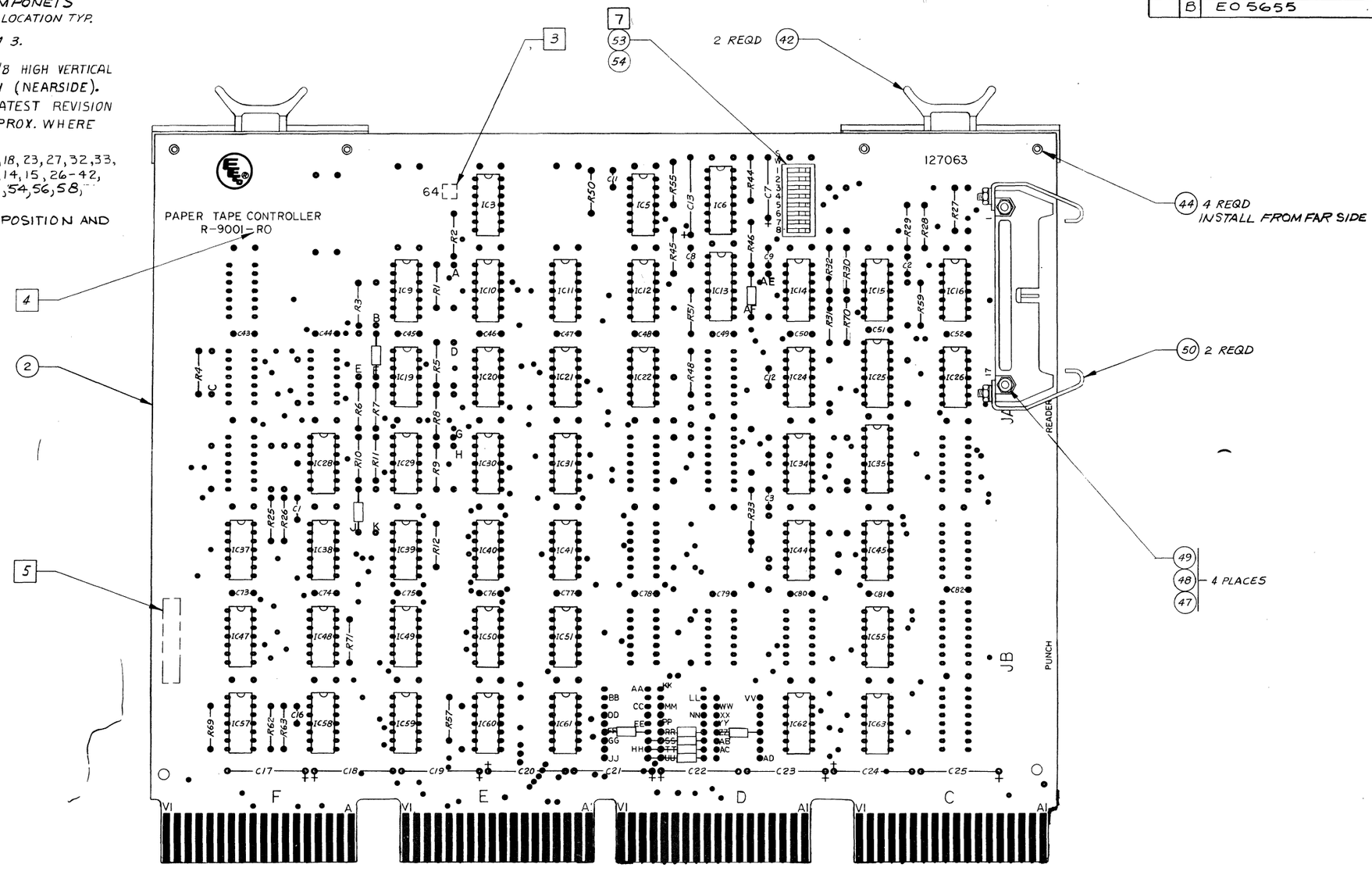
[3] FOR LATEST REVISION SEE ARTWORK, ITEM 3.

[4] RUBBER STAMP CHARACTERS SHOWN WITH 1/8 HIGH VERTICAL BLACK CHARACTERS APPROX WHERE SHOWN (NEARSIDE).

[5] RUBBER STAMP PART NO 127470-01 AND LATEST REVISION WITH 1/8 VERTICAL BLACK CHARACTERS APPROX. WHERE SHOWN (NEARSIDE).

6. REFERENCE DESIGNATIONS IC1,2,4,7,8,17,18,23,27,32,33, 36,42,43,46,52,53,54,56,64, C4,5,6,10,14,15, 26-42, 53-72, 83-90, R13-24, 34-43, 47, 49, 52, 53, 54, 56, 58, 60, 61, 64-68, 72, & JB ARE NOT USED.

[7] SET SWITCHES 1,2,3,5,6,7 TO THE "OFF" POSITION AND 4,8 TO THE "ON" POSITION.



SEE SEPARATE LIST OF MAT'L PL-127469-01

QTY REQD	ITEM NO.	REF DES	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL OR NOTE	CODE IDENT
PARTS LIST						

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES. TOLERANCES ON DECIMALS .XX± .XXX± ANGLE ± 1/2°

DO NOT SCALE DRAWING

BREAK SHARP EDGES

MATERIAL

FINISH

NEXT ASSY | USED ON APPLICATION

CONTRACT NO.

	APPROVED	DATE
DRAWN		4/9/75
CHECK		4/10/75
ENGR		4/10/75
MGR		4/11/75

ELECTRONIC PRODUCTS DIVISION
ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA

TITLE: PCB ASSY, PDP-11 INTFC (READER ONLY)

SIZE	CODE IDENT NO.	DWG NO.
D	97525	127469

SCALE: NONE | SHEET 1 OF 3

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1-73 DIETERICH-POST CLEARPRINT

127469

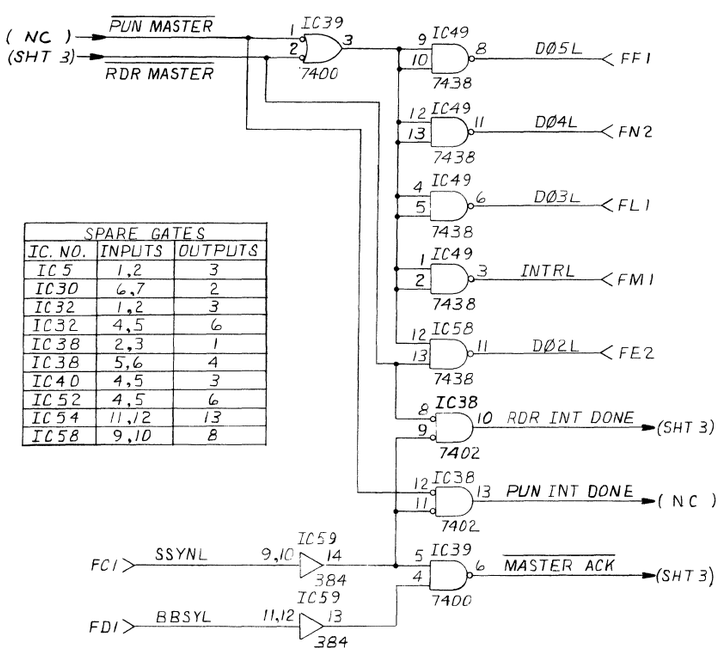
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
		SEE SHEET 1 FOR REV		

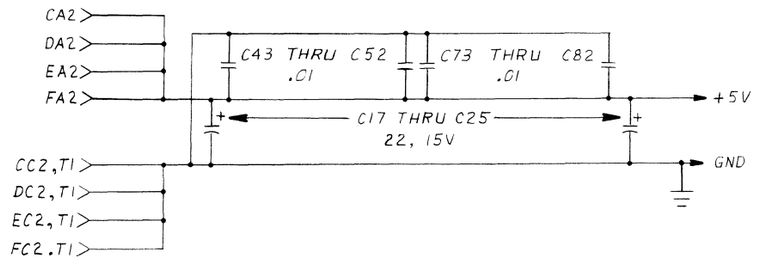
(CONTINUED FROM SHT 1)

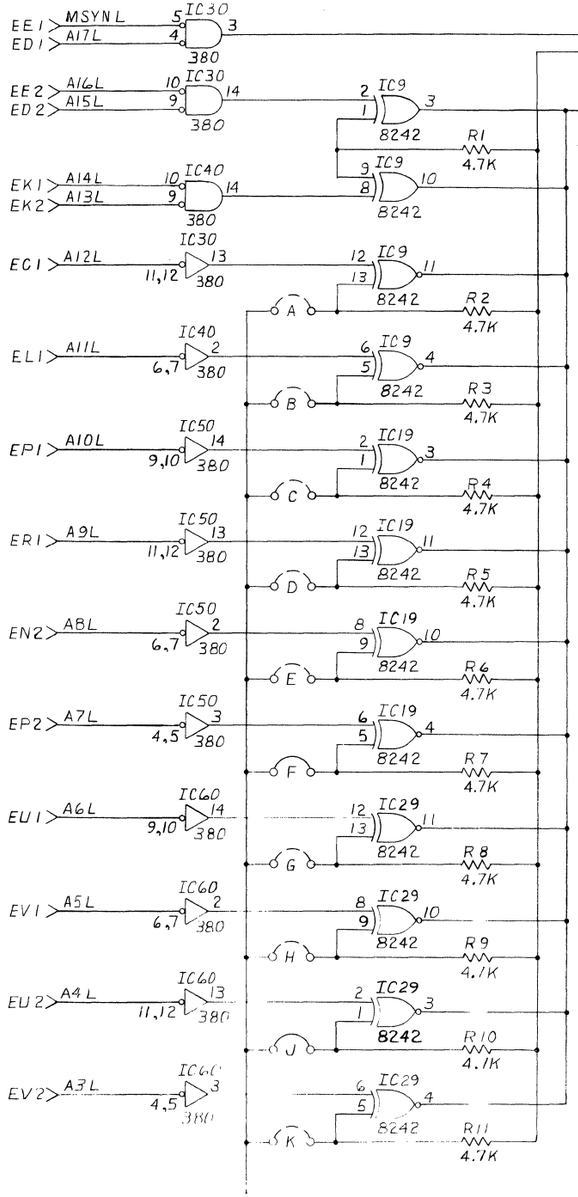
NOTES: UNLESS OTHERWISE SPECIFIED

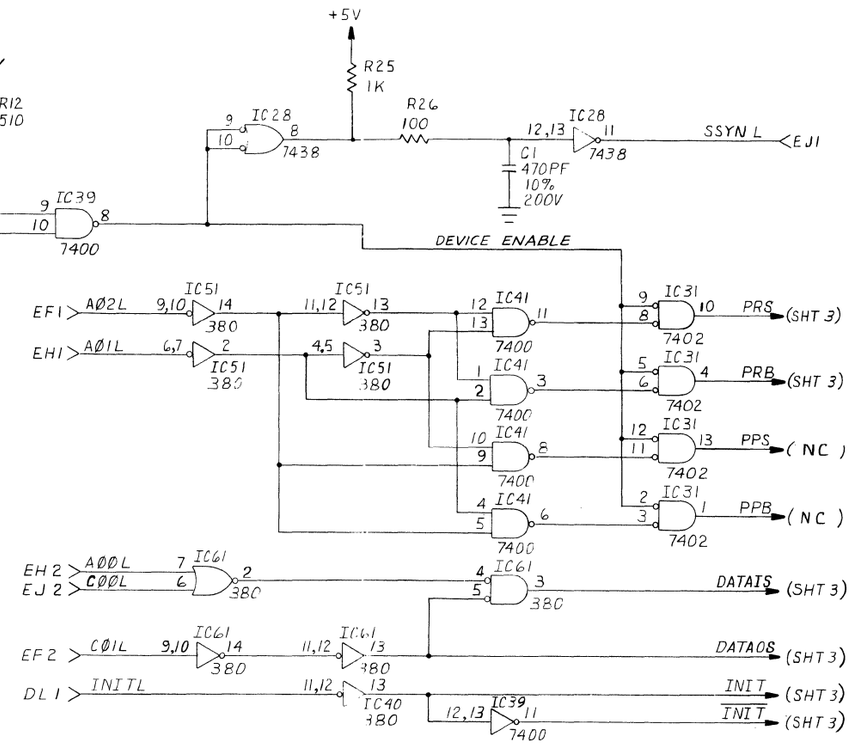
7. RESISTOR VALUES ARE IN OHM, ±5%, 1/4 WATT.
8. CAPACITOR VALUES ARE MICROFARADS, ±20%, 100V.
9. THE FOLLOWING DESIGNATIONS HAVE BEEN OMITTED IC 1,2,4,8, 43. C26 THRU 42, 53 THRU 72, 83 THRU 90. R13 THRU 24, 64 THRU 67.

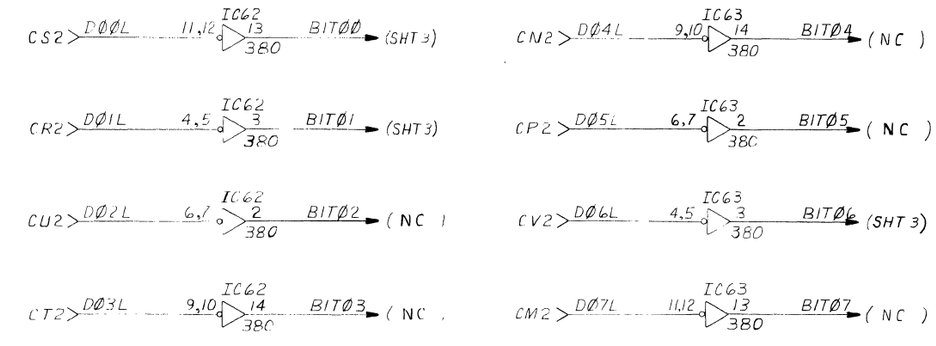
SPARE GATES		
IC. NO.	INPUTS	OUTPUTS
IC 5	1,2	3
IC30	6,7	2
IC32	1,2	3
IC32	4,5	6
IC38	2,3	1
IC38	5,6	4
IC40	4,5	3
IC52	4,5	6
IC54	11,12	13
IC58	9,10	8











SIZE	CODE IDENT NO.	DWG NO.
D	97525	127469
SCALE NONE		SHEET 2 OF 3

127469

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

SEE SH 1 FOR REV

RDR INT EN
RDR RUN
RDR FLAG
RDR INT RQ
RDR INT DONE
RFC
INIT
RCLK
PRS
DATAOS
BITØØ
BITØ1
BITØ6
DATA STROBE
RDR BG OUT
MASTER ACK
RDR MASTER
SACK L
BRL
BBSYL
DRIVE LEFT
DRIVE RIGHT
SPK
JUMPER
JUMPER
JUMPER
(NC)
DØ6L
DØ7L
DIIL
DI5L
DØØL CS2
DØ1L CR2
DØ2L CU2
DØ3L CT2
DØ4L CN2
DØ5L CP2
DØ6L CV2
DØ7L CM2
DH2
DF2
DE2
DD2
DL2
DN2
DR2
DT2
FT2
FDI
IC11 7474
IC12 7474
IC48 7474
IC35 7475
IC25 7475
IC6 9602
IC13 9602
C7 6.8 10% 35V
C8 .470PF, 10%, 200V
C9 .022, 10%, 50V
C11 .01
C12 .470PF, 10%, 200V
C13 4.7, 10%, 10V
C16 470PF, 10%, 200V
C2 .01
C3 .01
R44 47K
R45 15K
R46 33K
R50 100
R55 47K
R57 390
R59 1K
R62 180
R63 100
R69 180
R70 1.5K
R71 1K
R27 1K
R28 1K
R29 100
R30 100
R31 1K
R32 1K
R33 100
S6
S7
S8
+5V
+R
JA
SB

SIZE	CODE IDENT NO.	DWG NO.
D	97525	127469
SCALE NONE		SHEET 3 OF 3

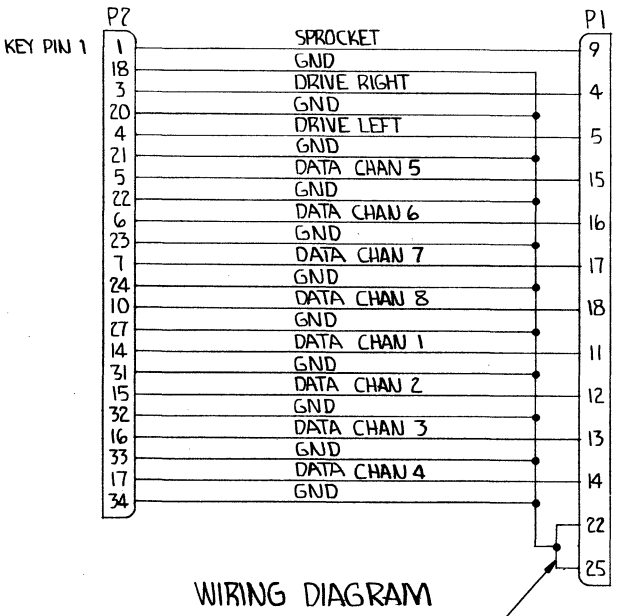
127469

TEKTRONIX 40-108

NOTES: UNLESS OTHERWISE SPECIFIED

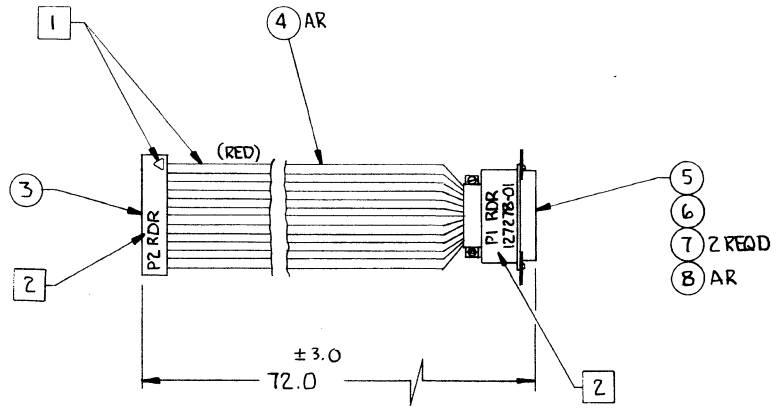
1. THE ◁ DESIGNATES PIN 1 OF THE CONNECTOR. PIN 1 OF THE FLAT CABLE IS DESIGNATED IN RED
2. RUBBER STAMP PART NO. 127278-01 & LATEST REV WHERE SHOWN, RUBBER STAMP RDR P1 & P2 AS SHOWN USING 1/8" HIGH CHAR WITH BLK PERM INK.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASED	5/2/75	
	B	EO 5655 RY	10/14/75	



WIRING DIAGRAM

COMMON BUSS TO BE INSTALLED INSIDE P1 CONNECTOR HOUSING.



SEE SEPARATE PARTS LIST 127278-01

		UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES. TOLERANCES ON DECIMALS .XX±.02 .XXX±.005 ANGLE ±0°3	CONTRACT NO.	ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA, SANTA ANA
		DO NOT SCALE DRAWING	DRAWN V. Moorhouse 2/24/75	TITLE: CABLE ASSY, READER INTERFACE
		BREAK SHARP EDGES	CHECK C. Rutledge 2-27-75	
		MATERIAL	ENGR D. Fung 3-5-75	
	230934		MGR [signature] 3/6/75	SIZE C; CODE IDENT NO. 97525; DWG NO. 127278
NEXT ASSY	USED ON	FINISH		SCALE NONE; SHEET 1 OF 1
APPLICATION				

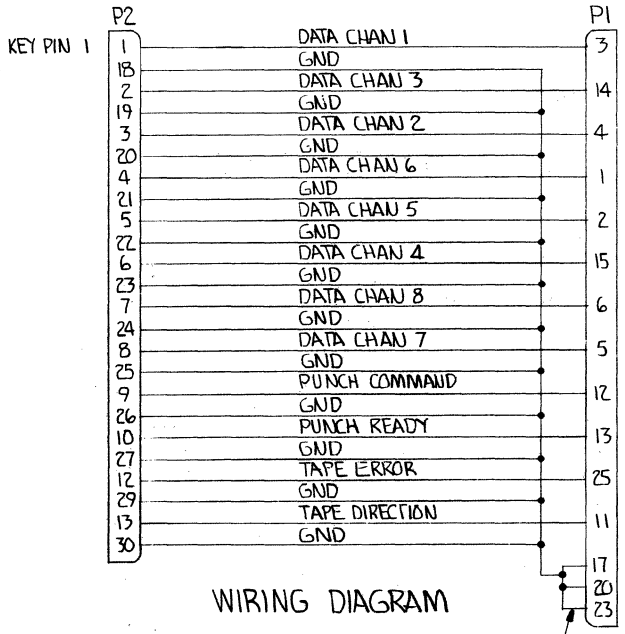
127278

BRUNING 40-105

NOTES: UNLESS OTHERWISE SPECIFIED

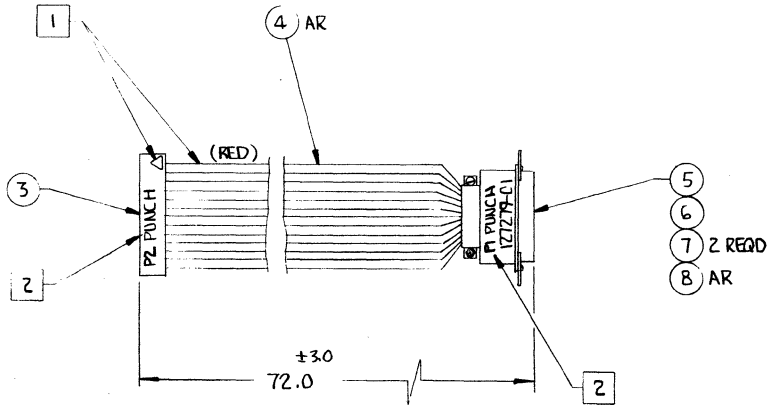
1. THE ◁ DESIGNATES PIN 1 OF THE CONNECTOR. PIN 1 OF THE FLAT CABLE IS DESIGNATED IN RED.
2. RUBBER STAMP PART NO. 127279-01 & LATEST REV WHERE SHOWN, RUBBER STAMP PUNCH & P1, P2 AS SHOWN USING 1/8" HIGH CHAR WITH BLK PERM INK.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	RELEASED	9/2/75	
	B	EO 5655 RY	10/14/75	



WIRING DIAGRAM

COMMON BUSS TO BE INSTALLED INSIDE P1 CONNECTOR HOUSING



SEE SEPARATE PARTS LIST 127279-01

NEXT ASSY	USED ON	UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES. TOLERANCES ON DECIMALS .XX±.02 .XXX±.005 ANGLE ±0°3	CONTRACT NO.	ELECTRONIC ENGINEERING COMPANY OF CALIFORNIA SANTA ANA
		DO NOT SCALE DRAWING	DRAWN 7/24/75	TITLE: CABLE ASSY, PUNCH INTERFACE
		BREAK SHARP EDGES	CHECK	
		MATERIAL	ENGR 8-3-75	
		FINISH	MGR 4/1/	SIZE C / CODE IDENT NO. 97525 / DWG NO. 127279
APPLICATION				SCALE NONE / SHEET 1 OF 1

127279

BRUNING 40-105

ELECTRONIC ENGINEERING
COMPANY OF CALIFORNIA